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BIOMED SERVICE MANUAL
Electrosurgical Generator
G400 Workstation Model 777000

CE 0344

Website: www.gyrusacmi.com

Federal law (USA) restricts the G400 for sale by, or on the order of, a physician or hospital.

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GYRUS ACMI
Power through integration
– Olympus

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Section II

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Section III

INTRODUCTION

Intention

This document must be used in conjunction with the G400 Operating Manual, which is shipped with all new G400 generators. It is assumed that all service personnel are familiar with and understand the contents of the operator manual. If required replacements can be ordered from GML (part number 277012). This document is not under change control so it is the responsibility of the reader to ensure they have the latest issue. Contacts are provided for this purpose.

Purpose of document

This service manual is intended expressly for the use of qualified biomedical engineers to perform basic output checks and safety tests to establish product conformity for the purpose of acceptance testing and annual maintenance. There are no user serviceable parts inside the generator. Gyrus ACMI recommends that G400 generators be inspected at least every 12 months to ensure continued safety of operation.

The “case open” calibration and repair requirements will be met by utilising appointed service centres, working under the auspices of the OEM’s Service Department.

Possession of this document does not constitute the right to perform any repair related work upon G400 electro-surgical generators. All drawings are supplied for reference only.

Any persons making use of this document to inspect or test the electro-surgical equipment so described will be expected to have attained an appropriate level of technical knowledge and skill such that all work is carried out in a fashion that neither constitutes a risk to the personal health of the service engineer nor compromises the electrical safety of the equipment.

The use of this document for the test and safety check tasks must be carried out utilising appropriate items of test equipment. At all times, the persons carrying out these functions must be aware of the implications of end user and patient safety.

Electrosurgery

The equipment described within this document is an electrosurgical generator. Electrosurgery functions by applying high frequency electrical power to the patient under surgeon command. In some instances, electrical powers of 200 W or more can be applied to the patient to implement the requisite tissue effect.

The user is referred to the instrument rear label and user manual for applicable specifications pertaining to this device. All applied parts, cables and handpieces used within the vicinity of the operating table will be sterilised. The electro-surgical generator and footswitch are considered non-sterile.

Since electro-surgery involves the application of direct electrical energy to the patient, this will naturally constitute a potential hazard in the case of equipment malfunction. In common with all other approved systems, the design and construction of the G400 generators have been subjected to rigorous safety tests. Each generator has undergone a stringent test regime during its manufacture and ensures that any generator will possess a commensurate level of safety integrity.

Legal notices and copyright

Gyrus ACMI authorises the copying of the pro-forma sheets for the sole purpose of recording the servicing activity.

The material presented within this document is provided for reference purposes only. All reasonable effort has been made to ensure that its content is accurate and factual. Gyrus ACMI does not warrant or make any representations or conditions regarding the use, validity, completeness, accuracy, or reliability of, or otherwise respecting, the information contained in this manual. Under no circumstances will Gyrus ACMI or any of their affiliated organisations be held liable for any personal injury, commercial loss or loss of profit, whether real, consequential or prospective, which is claimed to be due to be resulting from the use of this document.

The information contained in this manual is subject to change at any time without notice. Later editions of this manual will contain revised and updated material.

Any third party undertaking G400 generator testing must agree to comply with all pertinent regulatory issues in respect of the maintenance of the equipment. This may encompass mandatory compliance with those aspects of the Gyrus ACMI's quality system dealing with generator service.

Gyrus ACMI does not accept any responsibility for any G400 generator which has been subject to any unauthorised repair or modification by a third party or end user.

Gyrus ACMI's warranty is void once the lid seal is broken unless permission is granted in advance to allow the breaking of the seal. All liability, howsoever arising, is transferred to the customer if a device is opened, repaired or modified in any way by non-authorised personnel and the end user or other third party by its conduct shall be deemed to have agreed to indemnify and hold harmless Gyrus ACMI for any liability, costs, expenses, or losses which may arise as a result of the end user's or third party's action.

The exclusions, restrictions and limitations contained in this manual are intended to operate to the greatest extent permitted by any and all applicable laws

Use of this document

Performing basic output and safety tests, first line diagnosis may be attempted following a reported failure of the equipment during normal use. It is strongly recommended that any testing effort uses the tests outlined in the succeeding section.

Equipment Safety

CAUTION: **Any attempt to first line diagnose a generator should only be carried out by a suitably qualified person who has adequate training, knowledge and practical experience.**

WARNING: **Every precaution should be taken to avoid contact with the generator internal components whilst switched on, especially on the non-isolated side of the PSU board. Working on any live equipment is potentially dangerous.**

Diagnostic Test Equipment

The list of recommended test equipment to perform the routine checks of the generator is as follows:

1. Approved Electro-surgical analyser* ++
2. Approved instrument (IEC60601) to perform equipment safety tests
3. Biomed test cable PN: BTK-G400.

Where applicable the equipment must have a recognised calibration certificate.

*The G400 has RF output modalities that are very difficult for most electro-surgical analysers to measure. The Gyrus ACMI's technical authority has stated that testing the continuous wave and blended output modalities of the generator are sufficient to confirm full equipment functionality.

++ Gyrus ACMI recommend the use of a Fluke 8920A True RMS RF voltmeter or BC Biomedical ESU 2050, non-inductive load resistors and Pearson Current Transformer model 411 to measure the current output of the generator and calculate the delivered power. The 411 current transformer has a transfer function of 100mV per Amp. The calculated delivered power may be derived from:

$$Pm = (10*I_V)^2 * R_L$$

Where :
Pm is the measured power in Watts
I_V is the voltage measurement on the Fluke 8920A representing true RMS current (volts)
R_L is the non-inductive load resistor in ohms

Example

$$100W = (10 * 81.7x10^{-3}V)^2 * 150\Omega$$

Working Practises

FUSES

There are two mains fuses fitted to the generator; care must be taken to ensure any replacements fitted are approved types directly equivalent to the ones supplied by Gyrus ACMI. The fuse details are on the rear panel label.

ESD PRECAUATIONS

The generator contains electrostatic discharge sensitive components. Care should be taken to minimise the risk of electrostatic discharge.

Section IV

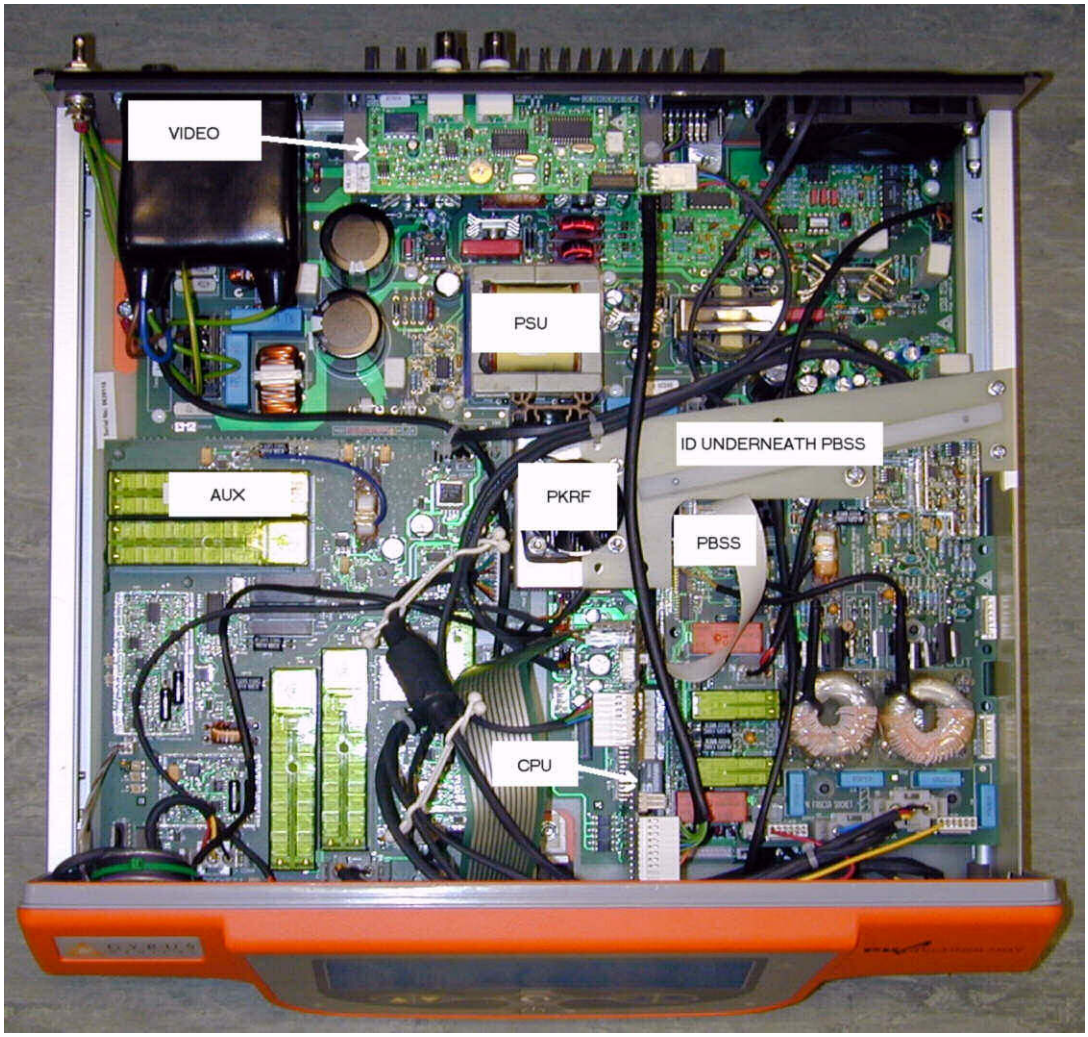
SYSTEM DESCRIPTIONS

Principles of Operation and Generator outputs.

The reader is referred to the operator manual.

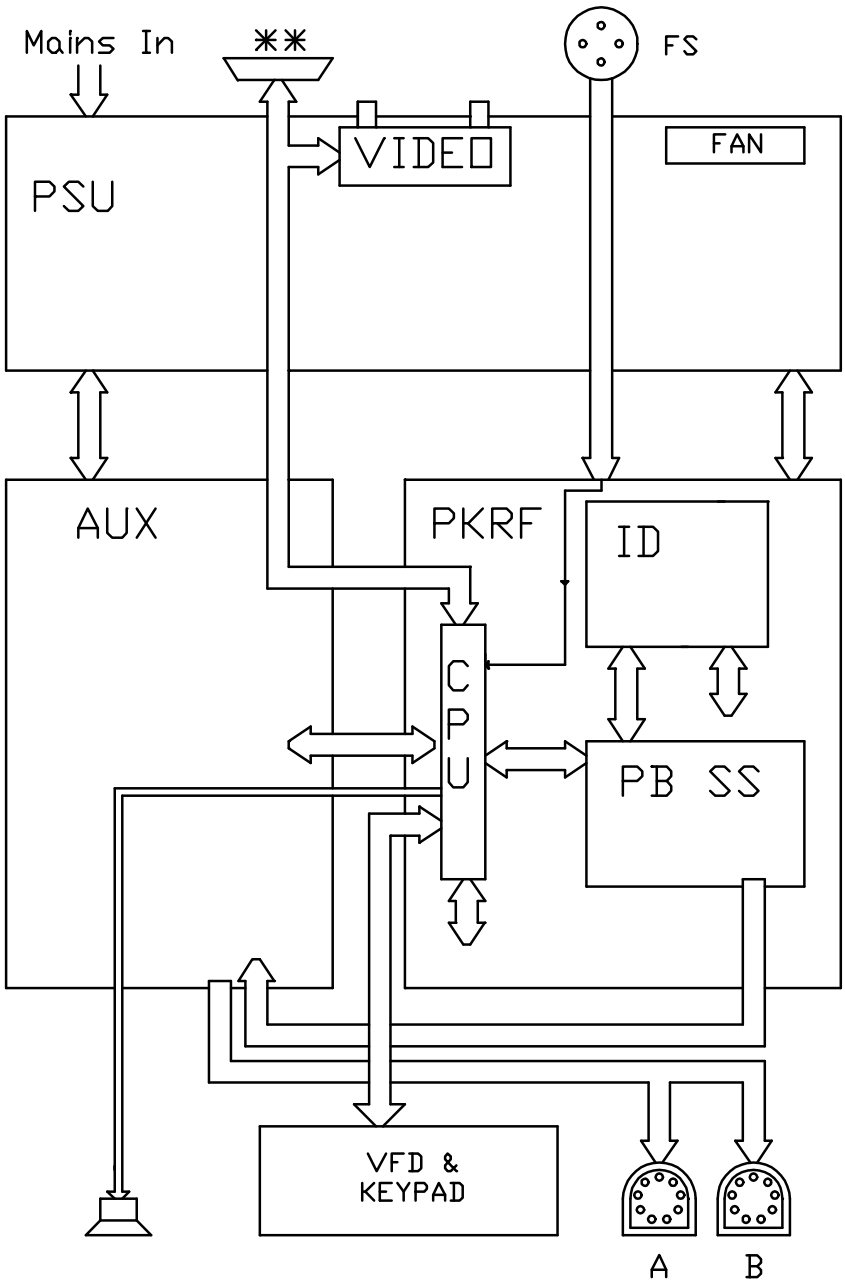
Generator Internal description

The G400 generator casework is comprised of the front fascia, rear panel, top and bottom panels, side extrusions and isolation board. The isolation board carries most of the Printed Circuit Boards (PCBs): Power Supply Unit (PSU), Plasmakinetic (PKRF) and the Auxiliary PCB. The CPU is a daughter board to the PKRF PCB. The PKRF also carries the Electrode Identification (ID) PCB and the Plasmablend Socket Select PCB as daughter boards. The ID PCB is the board closest to the PKRF PCB. The front fascia caries the Vacuum Fluorescent Display (VFD), membrane keypad, RF sockets and the loudspeaker. The rear panel carries the Video PCB. There is a rear panel mounted circulating fan that is activated by the electronics when required.



Note: Casework colour scheme may vary.

The figure below illustrates the interaction of the PCBs and some other sub assemblies.



** The communication port on the rear panel is for use by Gyrus ACMI personnel only or appointed representatives working under the auspices of Gyrus ACMI.

Section V

SERVICE PROCEDURES

Periodic Service

Inspect the Generator and Footswitch for obvious signs of mechanical damage or wear. Ensure that the generator case shows no sign of tampering. Evidence of damaged casework needs to be investigated to ensure that the internals of the generator are safe. Gyrus ACMI recommends the return of damaged generators to an approved service centre. The Gyrus ACMISales representative handling the generator account will be able to advise.

Check the generator back panel label is present and decipherable and that the front panel markings and symbols are still legible.

Retract the fuse drawer of the mains inlet connector and verify that both fuses are intact and match the rated current and breaking characteristics as per the back panel label.

Switch on the Generator, ensuring that the initial internal Power On Self Test (POST) is completed normally, as reported on the front panel display. Check that the audio alarm, front panel warning indicator and vacuum fluorescent display are functioning normally via the user verification sequence, which follows initialisation.

All servicing activity should be documented in accordance with local documented procedures. A typical format for service activity recording is included in section VIII.

PKRF output & RF leakage checks general preamble

Whilst in standby mode, the generator constantly monitors the A and B RF sockets to detect valid electrodes. The G400 generator has a number of operating modes that have defaults depending on the value of capacitors embedded in the applied electrodes. The connection of a valid electrode will cause the generator to select the appropriate default power settings for that particular electrode. Alternative power settings and modalities within a certain range may be alternatively selected by the user. The G400 generator identifies electrodes with an internal oscillator that changes frequency depending on the value of capacitance in the applied electrodes. To be able to measure the RF output of the generator, it is desirable to invoke the generator biomed test band by inserting the biomed test cable in to the generator output socket.

The use of the biomed test band is not to be used for clinical use. The biomed test band permits modalities that would be hazardous in a clinical application. For safety reasons, the biomed test band will time out after a short period.

Any doubt about the performance of the generator must be referred to the nearest service centre.

Warning-

There is a risk of electric shock, RF burns, personnel injury and equipment damage if safe working practises are not adhered to. Deployment of a Biomed Test Cable for the purpose of testing the RF output power of Gyrus ACMI G400 generators shall not cause Gyrus ACMI or any approved supplier, to be liable for direct, indirect consequential and/or injury and/or damages, even if Gyrus ACMI or such approved supplier have advised the possibility of such damages arising from any cause whatsoever, including negligence.

Applying a Biomed Test Cable to either the A or B output socket will enable the biomed test band full power PK1, PK2, PK3, T1, T2, PB1, PB2, PB3, PB4, VP1, VP2, VP3, TRIDES, TRIVP1, TRIVP2, TRIVP3, PBDES, PBVP1, PBVP2, PBVP3 & DES modalities with a time-out function.

To date, Gyrus has not received any data concerning unsuitability of third party electrosurgical analysers to perform basic RF output and RF leakage tests. As a guide, the analyser must have selectable non-reactive loads and have means to perform the RF leakage tests in accordance with IEC 60601-2-2 1998-2001. It is very unlikely that third party electrosurgical-analysers will be able to measure the pulsing or balanced outputs to a true RMS value. The PK1, PK2 and PK3 modes may be checked with relative ease, as these are nominally sinusoidal continuous waveforms. The PK3 is the most aggressive cut waveform as this has the highest voltage limit, followed by PK2 then PK1. Output checks should be prompted by the settings in the enclosed generator service report in section VIII. In short the test involves selecting the appropriate modality (PK1, PK2, PK3 etc) and nominal output power via the keyboard and display. The power output checks limits in the Generator Service report section VIII represent part of the published load curves for the G400 generator +/- 20%. It is assumed that the user is familiar with their electrosurgical analyser to select the appropriate non-reactive load impedance and measurement methodology. An appropriate footswitch is required to instigate RF outputs.

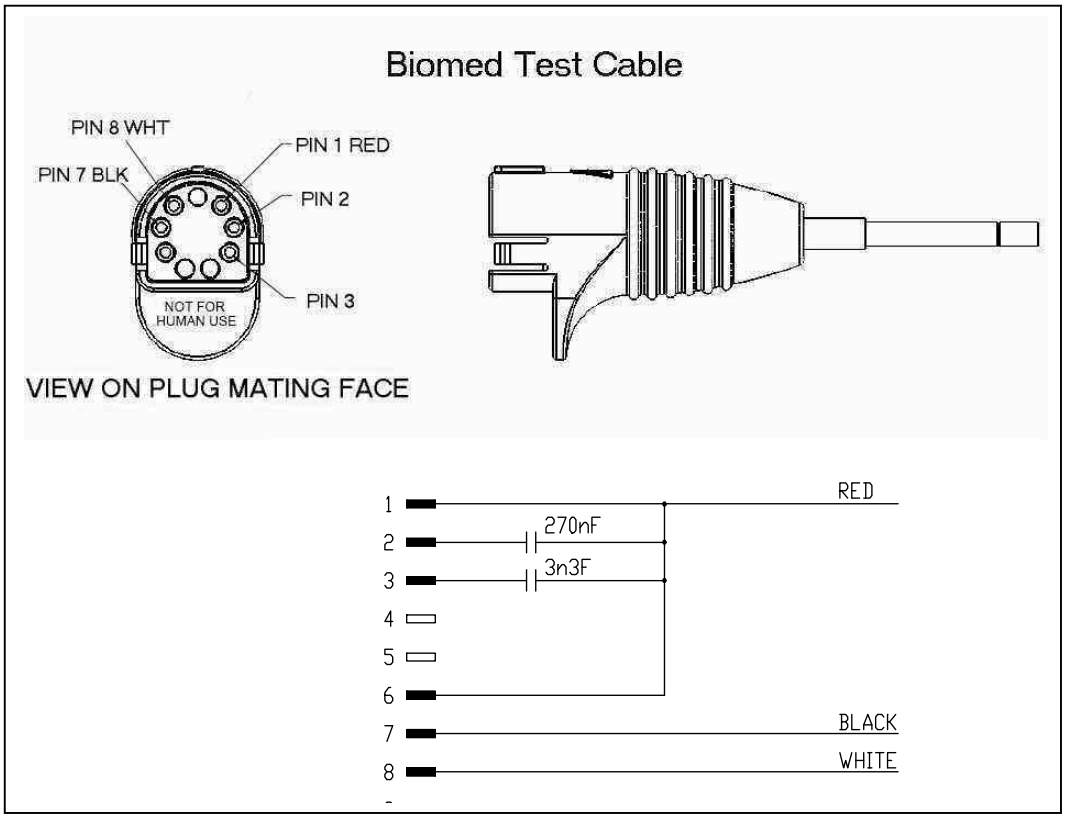
PB RF output checks

In this modality, RF energy may be split between three connections within the RF socket. It is unlikely that any commercially available electrosurgical analyzer can fully test this modality.

Any doubt about the performance of the PB output of the generator must be referred to the nearest service centre.

Quick start brief G400 output check (option 1)

1. Familiarization with the “PKRF output & RF leakage checks general preamble” & “Diagnostic Test equipment” sections detailed above are assumed.
2. Obtain a “Biomed Test Cable” PN: BTK-G400 from your account representative or your local Technical support representative (see image below). This cable is suitable for testing the G400 (777000) RF output.



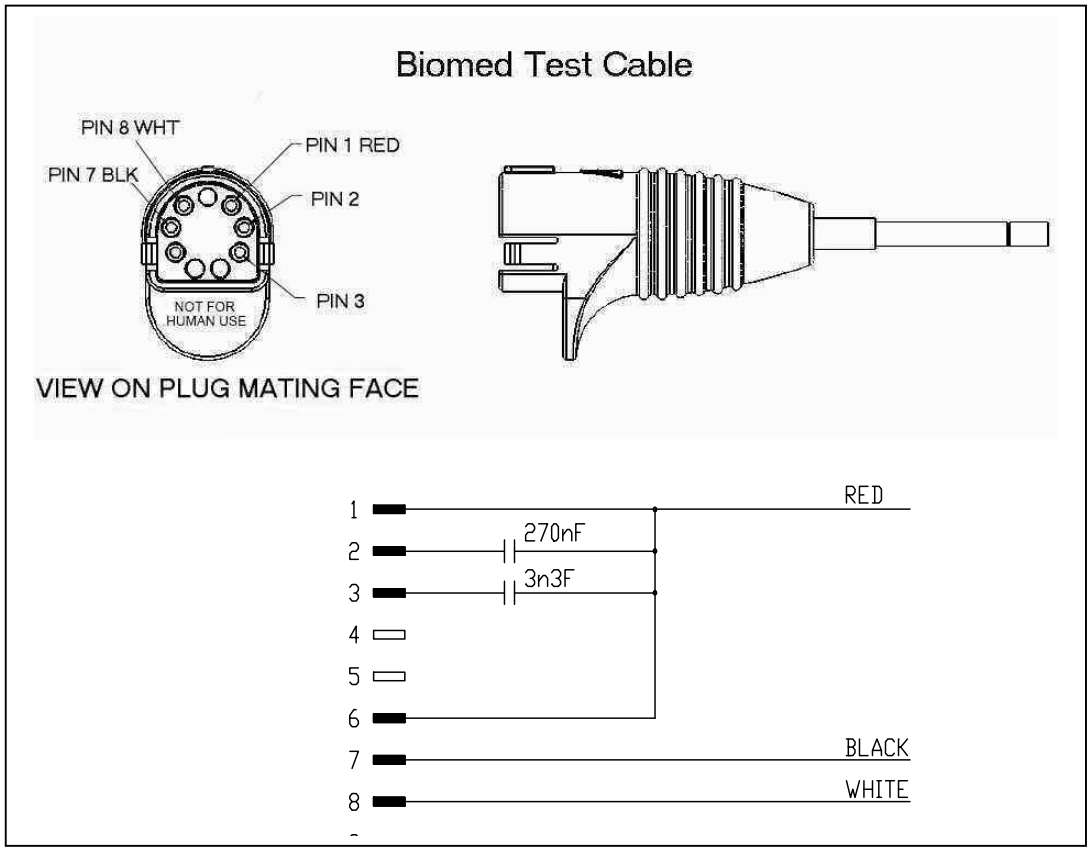
3. Prepare the Biomed Test Cable ends in a suitable manner to reduce the risk of electric shock or RF burns that also facilitates easy connection to the loads in the output test equipment.
4. When the test cable is plugged-into the front of the G400, the display will read: “BioMed Non-Human-Use” PK3 – 200 (watts), DES – 120 (watts). *There is an automatic timeout for the non human use Biomed Test Band.*
5. Connect the Biomed Test Cable red and black wires to the RF output test equipment [Electrosurgical Analyzer (ESU) or fixed loads]. These wires are not polarity sensitive.
6. Adjust the coagulation mode and wattage on the right side of the generator display to DES 60 (watts), set the ESU to 150 ohms input impedance and test for output. While depressing the blue footpedal, the output should measure between 50-74 watts.
7. Adjust the coagulation mode and wattage on the right side of the generator display to DES 120 (watts), set the ESU to 150 ohms input impedance and test for output. While depressing the blue footpedal, the output should measure between 66-96 watts.
8. Adjust the cut mode and wattage on the left side of the generator display to PK3 100 (watts), set the ESU to 150 ohms input impedance and test for output. While depressing the yellow footpedal, the output should measure between 85-115 watts.

9. Adjust the cut mode and wattage on the left side of the generator display to PK3 200 (watts), set the ESU to 150 ohms input impedance and test for output. While depressing the yellow footpedal, the output should measure between 179-216 watts.
10. If any questions or the generator does not meet the identified output specification(s), call Gyrus ACMI Technical Services detailed on the contacts page.

Test Mode	Load Impedance Ohms	Limits (Watts)
DES 60W (COAG)	150	50-74
DES 120W (COAG)	150	66-96
PK3 100W (CUT)	150	85-115
PK3 200W (CUT)	150	179-216

Detailed G400 output check (option 2)

1. Familiarization with the “PKRF output & RF leakage checks general preamble” & “Diagnostic Test equipment” sections detailed above are assumed.
2. Obtain a “Biomed Test Cable” PN: BTK-G400 from your account representative or your local Technical support representative (see image below). This cable is suitable for testing the G400 (777000) RF output.



3. Prepare the Biomed Test Cable ends in a suitable manner to reduce the risk of electric shock or RF burns that also facilitates easy connection to the loads in the output test equipment.
4. When the test cable is plugged-into the front of the G400, the display will read: “BioMed Non-Human-Use” PK3 – 200 (watts), DES – 120 (watts). There is an automatic timeout for the non human use Biomed Test Band.
5. Use the “Generator Service Report” in section VIII as a prompt to select the required generator modes, load impedance and measurement points on the biomed test cable to perform the designated power output checks.
6. Perform an RF output leakage test in accordance with a test regime to IEC60601-2-2. Most electrosurgical analysers simulate IEC60601-2-2 RF leakage test with a fixed value capacitance to ground. The PKRF leakage may be performed on the black and red wires of the Biomed Test Cable (set the generator to PK3 200W). The PB RF leakage may be performed on the black and white wires of the Biomed Test Cable (set the generator to PB3 200W 100% CUT). Record the maximum leakage current for each case on the “Generator Service Report” in section VIII.

7. If any questions or the generator does not meet the identified output specification(s), call Gyrus ACMI Technical Services detailed on the contacts page.

Video input output checks

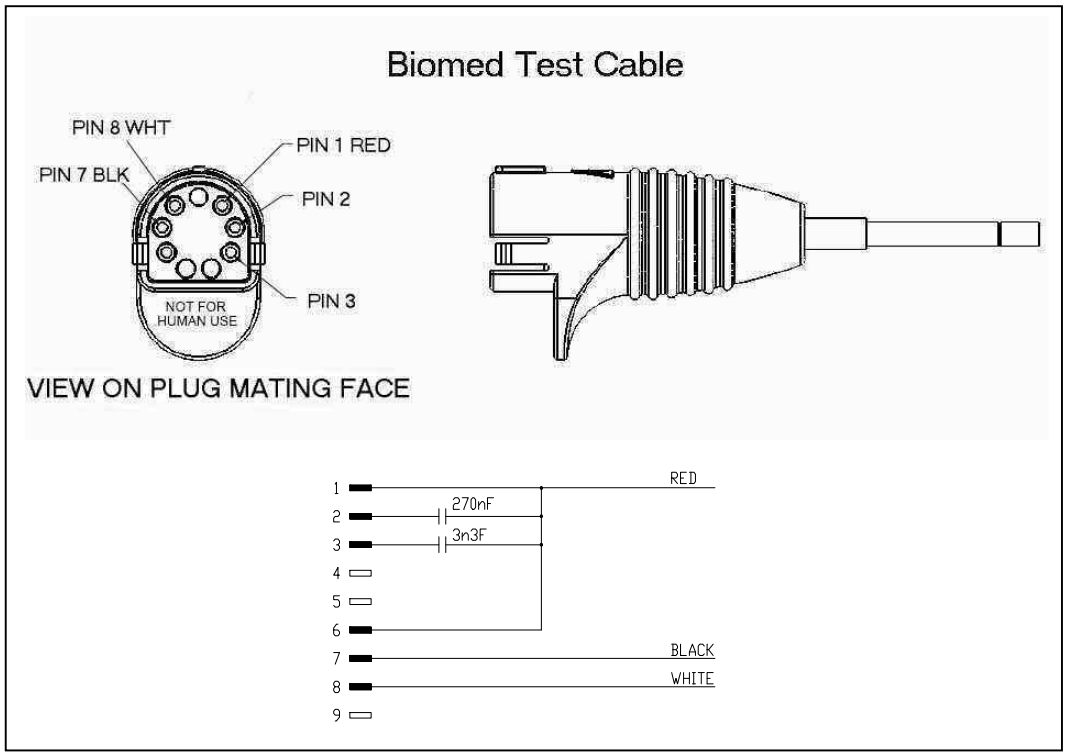
This generator may be configured to superimpose information on to a Colour Video Blanking & Sync (CVBS) video source presented at the VIDEO IN BNC. A mixed CVBS signal is then available at the VIDEO OUT BNC. This functionality is covered in the user manual for the generator. To test the video function of the generator, connect the video output of the generator to a monitor. With no electrodes attached, the generator should indicate Attach Instrument. Hold down the keypad Mode switch until the display intensity screen appears. Continue to press the Mode switch until Video OSD Select appears. Set the option to ON then press Mode to return to Attach Instrument. A blue screen should appear on the monitor with the text Attach Instrument superimposed. If a CVBS video source is now connected to the Video In BNC of the generator, the blue screen will change to the input video source with Attach Instrument text superimposed.

Mains electrical safety checks

Perform the electrical safety tests detailed in section VIII and outlined in IEC60601-1-1. Use a calibrated and approved safety tester designed for this purpose. The test limits for the G400 generator are appropriate to Class1 type BF. Use the Biomed Test Cable PN:BTK-G400 red, black and white wires to access the patient applied parts of the generator.

Note that generator RF output power is available on demand when the Biomed Test Cable is connected so observe all precautions cited in "PKRF output & RF leakage checks general preamble".

Record the test values and safety tester details on the form in section VIII.



Section VI

GENERATOR FAULT DIAGNOSIS

FAULT AND ERROR DIAGNOSIS

Fault Type Interpretation

Most technical problems are indicated by either a fault or error symbol that appears in the G400 Workstation display window and an associated indication on the video on screen display (OSD).

Fault Type

Three basic levels of fault reporting exist within the G400 Workstation, soft, recoverable and fatal.

SOFT [SOFT]

Soft describes events bringing the attention of the user to an attempt to use the G400 Workstation outside the specification. This will be annunciated by a warning beep.

An example of this would be “Power Limit” if the user were causing a short with the instrument.

Once the fault condition is removed the G400 Workstation will continue to operate as normal. No other user intervention is required.

RECOVERABLE [R] and [AR]

A recoverable fault is a transient, non-hazardous event recoverable using a G400 Workstation reset function. To reset the G400 Workstation after a fault occurs, first depress and release the mode key once. The fault symbol on the display should flash. Depress and release the mode key once more to complete the reset.

NOTE: [AR] faults are automatically cleared when the underlying fault is cleared no mode key operation is required. The workstation does not go through its power up reset sequence.

The symbol on the display will be of the form:

“FAULT CODE XXX REF XX”
Fault detected
Action needed”

IMPORTANT *Remember to take note of the fault symbol for reporting to a service engineer before completing the reset.*

FATAL [F] and [AF]

NOTE:

An [AF] fault will be reset automatically when the underlying fault is removed. The workstation will go through its power up reset sequence.

A fatal fault that is not recoverable by the user and is permanent for as long as the underlying fault is present. An error symbol is displayed the same as for the recoverable faults, except that it indicates that a service is required.

WARNING

An error symbol indicates an equipment malfunction that may be hazardous. Disconnect all accessories and switch the G400 Workstation off.
Switch the G400 Workstation back on and if the self-test is completed satisfactorily as evidenced by the "ATTACH INSTRUMENT" symbol on the display, the failure occurred in the accessories, which should be discarded and replaced. If the self-test fails, then all functions will be inhibited and no attempt should be made to use the G400 Workstation. Contact the appropriate address located on the front of the manual for assistance.

****To report an accessory failure, contact the appropriate address located on the front of the manual for assistance.**

FAULT CODES

The codes are grouped into the following groups:

100 - 199 Program crash, memory fault

200 - 299 Hardware failure (internal)

300 - 399 Dosage error, over-temperature
400 – 499 User error or equipment failure
500 - 599 Reserved for manufacture/engineer diagnostics
600 – 699 Internal Switching Faults

ERROR CODE	REF	VFD TEXT STRING	OSD TEXT STRING	TYPE	DESCRIPTION	ACTION
100	10	SYSTEM RESET	SYS RESET!	[R]	Software execution failure (watchdog reset)	Check mains supply & return for repair if error persists
100	11	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	ROM checksum failure	Internal Fault. Return for repair if error persists
100	12	SETTINGS CORRUPT	SETTINGS FLT!	[R]	Non volatile memory corrupt or not initialised	Internal Fault. Return for repair if error persists
100	13-16	-	-	-	Reserved	
100	17	SYSTEM RESET	SYS RESET!	R]	Software execution failure	Check mains supply & return for repair if error persists
100	18	INTERNAL ERROR	!!!! INTERNAL FAULT !!!!	[F]	Continuous test timing	Internal Fault. Return for repair if error persists

ERROR CODE	REF	VFD TEXT STRING	OSD TEXT STRING	TYPE	DESCRIPTION	ACTION
100	19	INTERNAL ERROR	!!!! INTERNAL FAULT !!!!	[F]	Background loop timing	Internal Fault. Return for repair if error persists
100	20	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Status_event_q overrun	Internal Fault. Return for repair if error persists
100	21	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	User_event_q overrun	Internal Fault. Return for repair if error persists
100	22	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Vfd_event_q overrun	Internal Fault. Return for repair if error persists
100	23	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Waveform_G400 Workstation_event_q overrun	Internal Fault. Return for repair if error persists
100	24-26	-	-	-	Reserved	
200	10	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PWM signal : shorted high	Internal Fault. Return for repair if error persists
200	11	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PWM signal : shorted low	Internal Fault. Return for repair if error persists
200	12-13	-	-	-	Reserved	
200	14	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Energy signal: stuck high	Internal Fault. Return for repair if error persists
200	15-17	-	-	-	Reserved	
200	18	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	CUT/COAG signal : stuck high	Internal Fault. Return for repair if error persists
200	19	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	CUT/COAG signal : stuck low	Internal Fault. Return for repair if error persists
200	20	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	CLAMP signal error (DAC output)	Internal Fault. Return for repair if error persists
200	21	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	BOOST signal error (DAC output)	Internal Fault. Return for repair if error persists
200	22	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PEAKSET signal error (DAC output)	Internal Fault. Return for repair if error persists
200	23	-	-	-	Reserved	
200	24	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	RF_DET signal error : stuck low	Internal Fault. Return for repair if error persists
200	25	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	OVERDOSE signal error : permanently ON	Internal Fault. Return for repair if error persists
200	26	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	ENERGY signal error : stuck low	Internal Fault. Return for repair if error persists

ERROR CODE	REF	VFD TEXT STRING	OSD TEXT STRING	TYPE	DESCRIPTION	ACTION
200	27	SYSTEM RESET	!!!! INTERNAL FAULT !!!!	[F]	PlasmaBlend Transformer feedback failure	Internal Fault. Return for repair if error persists
200	28	INTERNAL FAILURE / WARMING UP	!!!! INTERNAL FAULT!!! WARMING UP	[SOFT] [F]	G400 Workstation too cold, dependent on temperature. Allow to reach room temperature.	None
200	29 - 30	-	-	-	Reserved	
200	31	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	CURRLIM signal error (DAC output)	Internal Fault. Return for repair if error persists
200	32	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	VOLTLIM signal error (comparator input)	Internal Fault. Return for repair if error persists
200	33	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	BUSVOLTS signal error (analogue input)	Internal Fault. Return for repair if error persists
200	34	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Incorrect PK RF board installed	Internal Fault. Return for repair if error persists
200	35	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	RF relay 1 (socket) not operating	Internal Fault. Return for repair if error persists
200	36	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	RF relay 2 (poles) not operating	Internal Fault. Return for repair if error persists
200	37-41	-	-	-	Reserved	
200	42	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	CPU POST Thermistor failure	Internal Fault. Return for repair if error persists
200	43	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	CPU POST failure	Internal Fault. Return for repair if error persists
200	44	RAM	!!!! INTERNAL FAULT !!!!	[R]	RAM test failure [POST check]	Internal Fault. Return for repair if error persists
200	45	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Crystal failure [POST check]	Internal Fault. Return for repair if error persists
200	46	-	-	-	NOT USED	
200	47	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Analogue reference failure [POST check]	Internal Fault. Return for repair if error persists
200	48	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	CLAMP_SET failure [POST check]	Internal Fault. Return for repair if error persists
200	49	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	BOOST_SET failure [POST check]	Internal Fault. Return for repair if error persists
200	50	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	CURRLIM_SET failure [POST check]	Internal Fault. Return for repair if error persists

ERROR CODE	REF	VFD TEXT STRING	OSD TEXT STRING	TYPE	DESCRIPTION	ACTION
200	51	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PEAK_SET failure [POST check]	Internal Fault. Return for repair if error persists
200	52	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	COAG_CUT failure [POST check]	Internal Fault. Return for repair if error persists
200	53	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PK_CUT_COAG failure [POST check]	Internal Fault. Return for repair if error persists
200	54	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PK_SKT_SET failure [POST check]	Internal Fault. Return for repair if error persists
200	55	-	-	-	Reserved	
200	56	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	NO_RF failure [POST check]	Internal Fault. Return for repair if error persists
200	65	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[R]	RFBUS_VOLTS failure [POST check]	Internal Fault. Return for repair if error persists
200	66	-	-	-	Reserved	
200	67	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PSU_STATUS failure [POST check]	Internal Fault. Return for repair if error persists
200	68	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[R]	Mains input failure [POST check]	Internal Fault. Return for repair if error persists
200	69	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	OVERDOSE failure [POST check]	Internal Fault. Return for repair if error persists
200	70	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PWM low failure [POST check]	Internal Fault. Return for repair if error persists
200	71	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	ID CAL circuit failure [POST check]	Internal Fault. Return for repair if error persists
200	72	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	BUSLIM failure [POST check]	Internal Fault. Return for repair if error persists
200	73	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	CURRLIM failure [POST check]	Internal Fault. Return for repair if error persists
200	74	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	VOLTLIM failure [POST check]	Internal Fault. Return for repair if error persists
200	75	-	-	-	Reserved	
200	76	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	VCC_ANA_DIV_2 failure [POST check]	Internal Fault. Return for repair if error persists
200	77	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	12V failure [POST check]	Internal Fault. Return for repair if error persists
200	78	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	0V failure [POST check]	Internal Fault. Return for repair if error persists

ERROR CODE	REF	VFD TEXT STRING	OSD TEXT STRING	TYPE	DESCRIPTION	ACTION
200	79	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PK-RF Thermistor failure [POST check]	Internal Fault. Return for repair if error persists
200	80	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	RF_VOLTAGE [POST check]	Internal Fault. Return for repair if error persists
200	81	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	RF_CURRENT failure [POST check]	Internal Fault. Return for repair if error persists
200	82	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	ANALOGUE_REF failure	Internal Fault. Return for repair if error persists
200	83	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	VCC_ANA_DIV_2 failure	Internal Fault. Return for repair if error persists
200	84	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	12V failure	Internal Fault. Return for repair if error persists
200	85	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	0V failure	Internal Fault. Return for repair if error persists
200	86	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	RF_DET stuck high failure	Internal Fault. Return for repair if error persists
200	87	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PSU_STATUS failure	Internal Fault. Return for repair if error persists
200	88	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Mains input failure	Internal Fault. Return for repair if error persists
200	89	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	BUSLIM failure	Internal Fault. Return for repair if error persists
200	90	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	CURRLIM_SET failure	Internal Fault. Return for repair if error persists
200	91	-	-	-	Reserved	
200	92	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Over active ID count	Internal Fault. Return for repair if error persists
200	93	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	External Watchdog unable to reset CPU	Internal Fault. Return for repair if error persists
200	94	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Internal Watchdog unable to reset CPU	Internal Fault. Return for repair if error persists
300	10	THERMAL SHUTDOWN	INT FAILURE	[R]	Internal overheating	Check duty cycle of operation. Return for repair if error persists
300	11	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Excess RF input voltage error (RFBUS > set)	Internal Fault. Return for repair if error persists
300	12	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	PK-RF board overheating	Check duty cycle of operation. Return for repair if error persists

ERROR CODE	REF	VFD TEXT STRING	OSD TEXT STRING	TYPE	DESCRIPTION	ACTION
300	13	-	-	-	Reserved	
300	14	<Instrument Dependant> i.e. regrasp or powerlimit or N/A	<Instrument Dependant> i.e. regrasp or powerlimit or N/A	[AR]	Accessory error : excessive RF output current Output shorted – the error text and user interaction are dependant on the instrument. See table 11.2.3.	Check IFU for correct operation. Return for repair if error persists
300	15-18	-	-	-	Reserved	
300	19	INVALID INSTRUMENTS	INVALID INSTRUMENTS	[SOFT]	Two instruments have been attached which are the same type	Check IFU for correct operation.
300	20	INVALID INSTRUMENT	INVALID INS	[SOFT]	Unsupported instrument type	Check IFU for correct operation.
300	21	-	-	-	Reserved	
300	22	Please Clean Tip	Please Clean Tip	[SOFT]	Detected an instrument with a build up of debris. Instrument requires cleaning.	Check IFU for correct operation.
400	10	FOOTPEDAL STUCK	FTPDL STUCK!	[AF]	Footswitch BLUE pedal stuck	Don't depress buttons during power up. Try another footswitch. Return for repair if error persists
400	11	FOOTPEDAL STUCK	FTPDL STUCK!	[AF]	Footswitch YELLOW pedal stuck	Don't depress buttons during power up. Try another footswitch. Return for repair if error persists
400	12	FOOTPEDAL STUCK	FTPDL STUCK!	[AF]	Footswitch MODE pedal stuck	Don't depress buttons during power up. Try another footswitch. Return for repair if error persists
400	14	INTERNAL FAILURE	!!!! INTERNAL FAULT !!!!	[F]	Instrument identification circuit fault	Try another handpiece cable & instrument. Return for repair if error persists
400	15	BUTTON STUCK	BUTTON STUCK!	[R]	Front panel : Yellow UP button stuck	Don't depress buttons during power up. Return for repair if error persists
400	16	BUTTON STUCK	BUTTON STUCK!	[R]	Front panel : Yellow DOWN button stuck	Don't depress buttons during power up. Return for repair if error persists

ERROR CODE	REF	VFD TEXT STRING	OSD TEXT STRING	TYPE	DESCRIPTION	ACTION
400	17	BUTTON STUCK	BUTTON STUCK!	[R]	Front panel : Blue UP button stuck	Don't depress buttons during power up. Return for repair if error persists
400	18	BUTTON STUCK	BUTTON STUCK!	[R]	Front panel : Blue DOWN button stuck	Don't depress buttons during power up. Return for repair if error persists
400	19	BUTTON STUCK	BUTTON STUCK!	[R]	Front panel : MODE button stuck	Don't depress buttons during power up. Return for repair if error persists
400	20	BUTTON STUCK	BUTTON STUCK!	[R]	Front panel : STANDBY button stuck	Don't depress buttons during power up. Return for repair if error persists
400	21	-	-	-	Reserved	
400	22	HANDSWITCH STUCK	HDSWT STUCK!	[AF]	Handswitch Yellow button stuck	Don't depress buttons during power up. Return for repair if error persists
400	23	HANDSWITCH STUCK	HDSWT STUCK!	[AF]	Handswitch Blue button stuck	Don't depress buttons during power up. Return for repair if error persists
400	24	HANDSWITCH STUCK	HDSWT STUCK!	[AF]	Handswitch Mode button stuck	Don't depress buttons during power up. Return for repair if error persists
400	30	-	-	-	Reserved	
500	10	-	-	-	Reserved	
600	01	SYSTEM RESET	!!!! INTERNAL FAULT !!!!	[F]	POST Aux board ADC check. Raised if the Aux board ADC does not respond in time	Internal Fault. Return for repair if error persists
600	02	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board relay checks	Internal Fault. Return for repair if error persists
600	03	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board relay 1 fail	Internal Fault. Return for repair if error persists
600	04	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board relay 2 fail	Internal Fault. Return for repair if error persists
600	05	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board relay 3 fail	Internal Fault. Return for repair if error persists
600	06	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board relay 4 fail	Internal Fault. Return for repair if error persists

ERROR CODE	REF	VFD TEXT STRING	OSD TEXT STRING	TYPE	DESCRIPTION	ACTION
600	07	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board relay 5 fail	Internal Fault. Return for repair if error persists
600	08	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board relay 6 fail	Internal Fault. Return for repair if error persists
600	09	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board relay 7 fail	Internal Fault. Return for repair if error persists
600	10	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board relay 8 fail	Internal Fault. Return for repair if error persists
600	11	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board +5vPC_A fail	Internal Fault. Return for repair if error persists
600	12	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Aux board +V_OSET fail	Internal Fault. Return for repair if error persists
600	13	INTERNAL FAULT	!!!! INTERNAL FAULT !!!!	[F]	Handswitching error	Internal Fault. Return for repair if error persists

GENERATOR DISASSEMBLY

The G400 generator has a Gyrus ACMI warranty seal that when broken, will invalidate the warranty of the generator.

There are no customer serviceable components inside the generator case.

The generator casework is assembled with security screws that require special tooling that is unavailable to third parties.

Section VII

Decontamination of returned product

Neither the generator nor footswitch may be sterilised. To decontaminate the generator or footswitch surfaces, use a mild antibacterial detergent on a damp cloth. Do not allow fluids to enter the generator or footswitch connectors. Do not use caustic, or abrasive cleaning materials.

All equipment received by a service facility from the user, should be accompanied by a relevant certificate of decontamination. This certificate should detail the method of decontamination, the date of process and the name and signature of the person responsible.

Handpiece/Connector Cables may be sterilized according to the product's Instructions for Use

If the equipment is already free from contamination, as in the case of a brand new generator being returned, a signed certificate is still required with a statement as to why the generator is believed to be free from contamination.

WARNING: If suspicion of a particular risk exists then contact should be made with the relevant Hospital Infection Control Manager or Epidemiologist whilst the equipment in question is quarantined.

Section VIII

Generator service report

G400 Generator Test Results Page 1 of 3	
Model	**G400 Workstation**
Serial number	
Registered Manufacturer	**Gyrus ACMI Inc,136 Turnpike Road, Southborough, MA 1772-2104, USA**
ECREP	**Gyrus Medical Ltd, Fortran Road, St Mellons, Cardiff, CF3 0LT UK**
Supplier / contact	
Approvals	**CE mark in accordance with MDD 93/42/EEC IEC60601-1 (1998-2001) IEC60601-1-1 (1998-2001) IEC60601-1-2 (2001) IEC60601-2-2 (1998-2001)**
Equipment class as per IEC60601-1 (1998-2001)	**Class 1**
Equipment category	**Type BF**
Date of acquisition	
Inventory Number	
Location of equipment	
Service Centre	
Service contract reference	
Additional information	

G400 Generator Test Results Page 2 of 3						
Parameter			**IEC 60601-1**	**IEC 60601-2-2**	**Limits(s)**	**Measured Value**
Protective Earth Impedance (PE)			18(f)	----	0.1 ohm (0.2 inc mains lead)	Ω
PE test current			18(f)	----	10 - 25A	A
Input voltage (V)			----	----	----	V
Input current: activating (I)			----	----	----	A
Input current: standby (I_Q)			----	----	----	A
Input power (V x I)			7.1	----	440VA	VA
Earth leakage current (NC)			19.1(e)	----	500uA	uA
Earth leakage current (SFC)			19.2(a)	----	1mA	mA
Enclosure leakage current (NC)			19.1(d)	----	100uA	uA
Enclosure leakage current (SFC)			19.2(c)	----	500uA	uA
Patient leakage current (NC)			19.1(e)	----	100uA	uA
Patient auxiliary leakage current (NC)			19.1(f)	----	100uA	uA
Patient auxiliary leakage current (SFC)			19.1(f)	----	500uA	uA
Patient leakage (mains on applied part)			19.2(b)	----	5mA	mA
PK RF output power checks			----	----	----	----
Modality	Set Watt	Load Ω	----	----	----	----
PK3	200W	68 (Bk – Rd)	----	50.2	170 – 220W	W
PK3	200W	150 (Bk – Rd)	----	50.2	162 – 223W	W
PK3	200W	1000 (Bk – Rd)	----	50.2	92 – 135W	W
PK3	100W	150 (Bk – Rd)	----	50.2	83 – 121W	W
DES	120W	68 (Bk – Rd)	----	50.2	92 – 135W	W
DES	120W	150 (Bk – Rd)	----	50.2	66 – 96W	W
DES	120W	1000 (Bk – Rd)	----	50.2	12.1 – 16.9W	W
DES	60W	68 (Bk – Rd)	----	50.2	51 – 76W	W
DES	60W	150 (Bk – Rd)	----	50.2	50 – 74W	W
DES	60W	1000 (Bk – Rd)	----	50.2	11.5 – 16.8W	W
PB1 100% CUT	200W	5 (Bk – Rd)	----	50.2	>80W	W
PB1 100% CUT	200W	500 (Bk – Rd)	----	50.2	157 – 211W	W
PB1 100% CUT	100W	5 (Bk – Rd)	----	50.2	57 – 76W	W
PB1 100% CUT	100W	500 (Bk – Rd)	----	50.2	85 – 115W	W
PBDES	200W	20 (Bk – Wh)	----	50.2	162 – 219W	W
PBDES	200W	300 (Bk – Wh)	----	50.2	32 – 47W	W
PBDES	100W	20 (Bk – Wh)	----	50.2	85 – 113W	W
PBDES	100W	300 (Bk – Wh)	----	50.2	32 – 47W	W

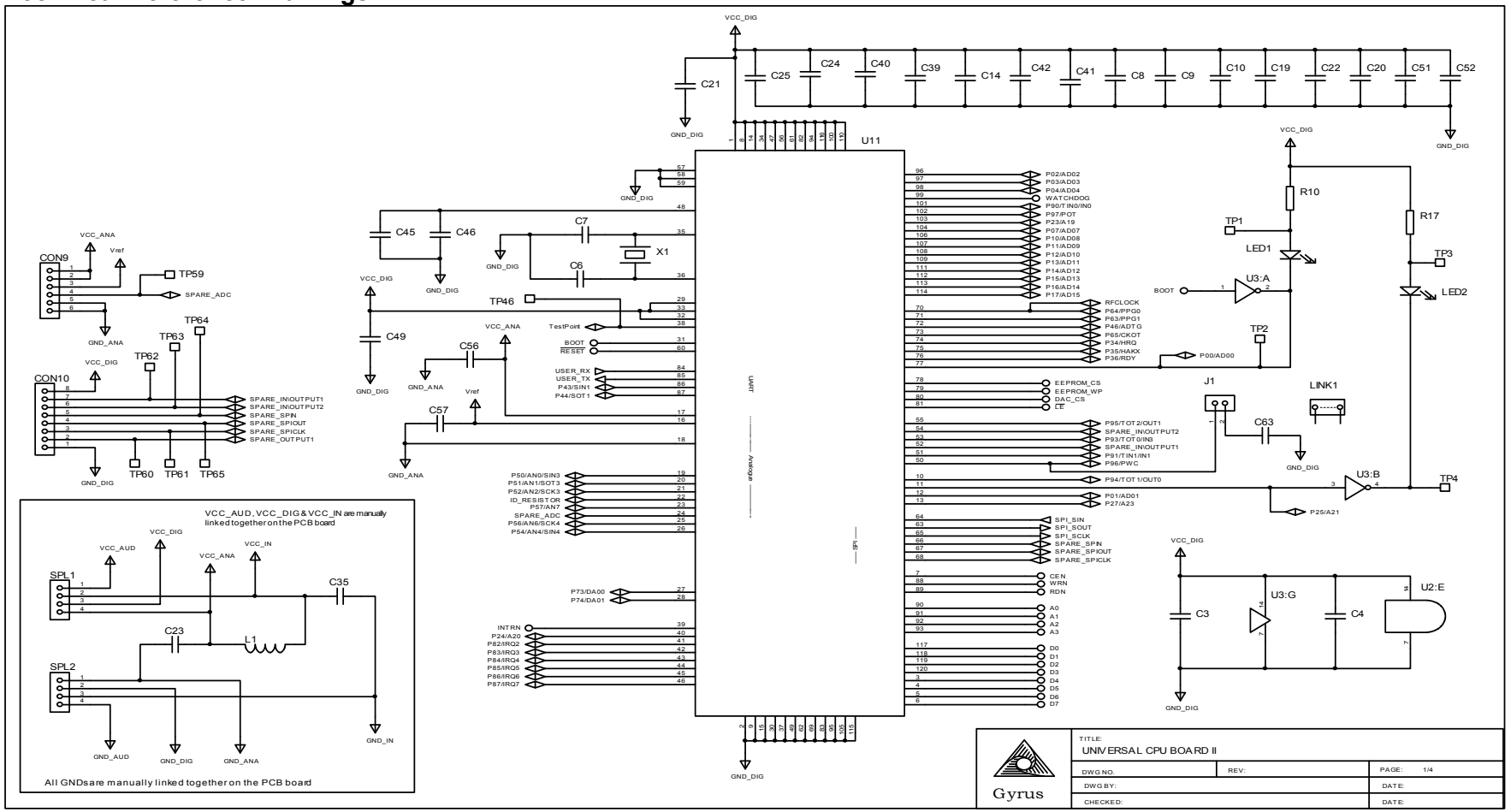
G400 Generator Test Results Page 3 0f 3						
PBDES	50W	20 (Bk – Wh)	----	50.2	43 - 56	W
PBDES	50W	300 (Bk – Wh)	----	50.2	30 – 56W	W
PBDES	50W	1000 (Bk – Wh)	----	50.2	10 – 13W	W
PKRF leakage current			----	19.101(c)	100mA	mA
PB RF leakage current			----	19.101(c)	100mA	mA

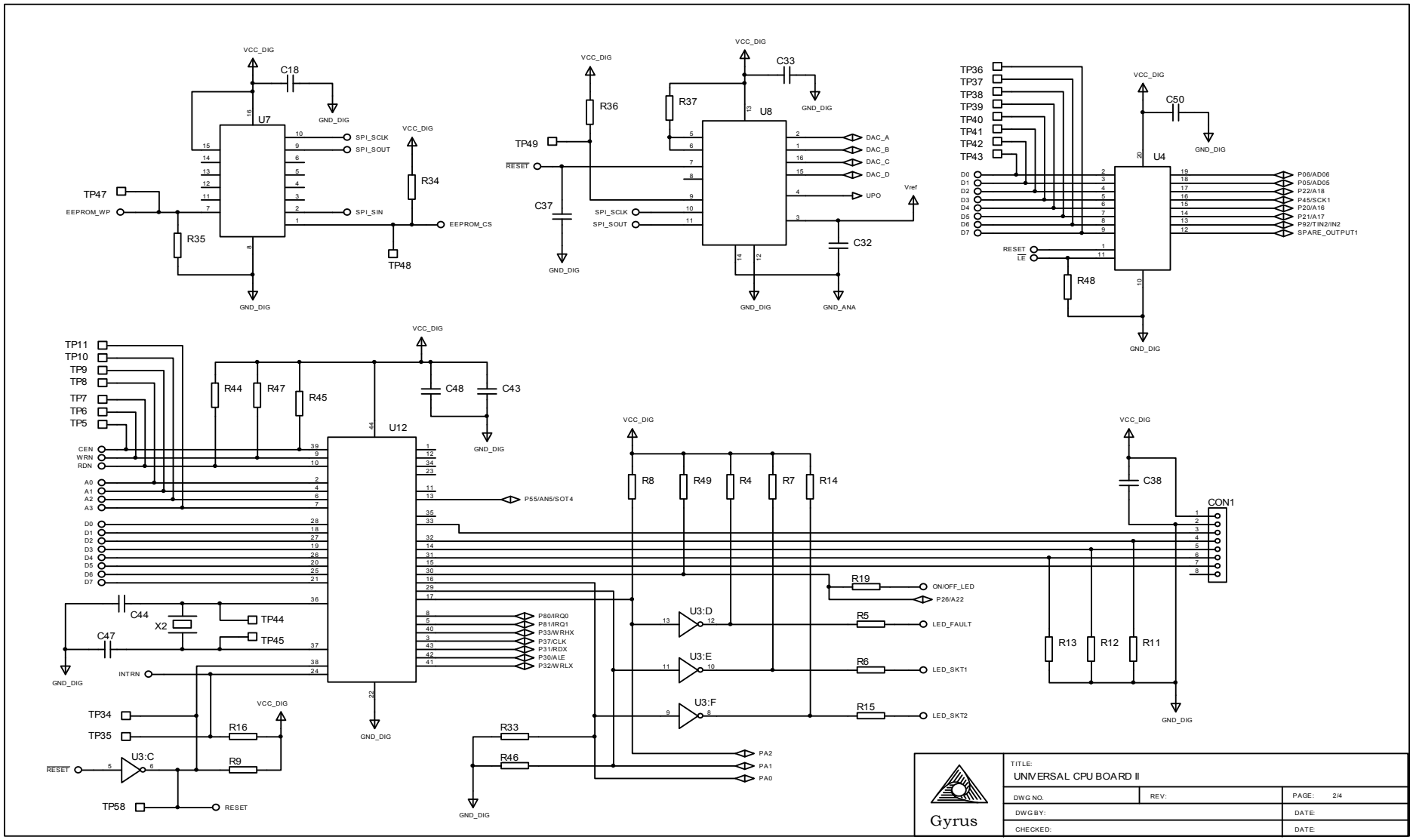
Video check pass/fail				
Electrosurgical analyser model number				
Electrosurgical analyser serial number				
Electrosurgical analyser calibration	Start date		Expiry date	

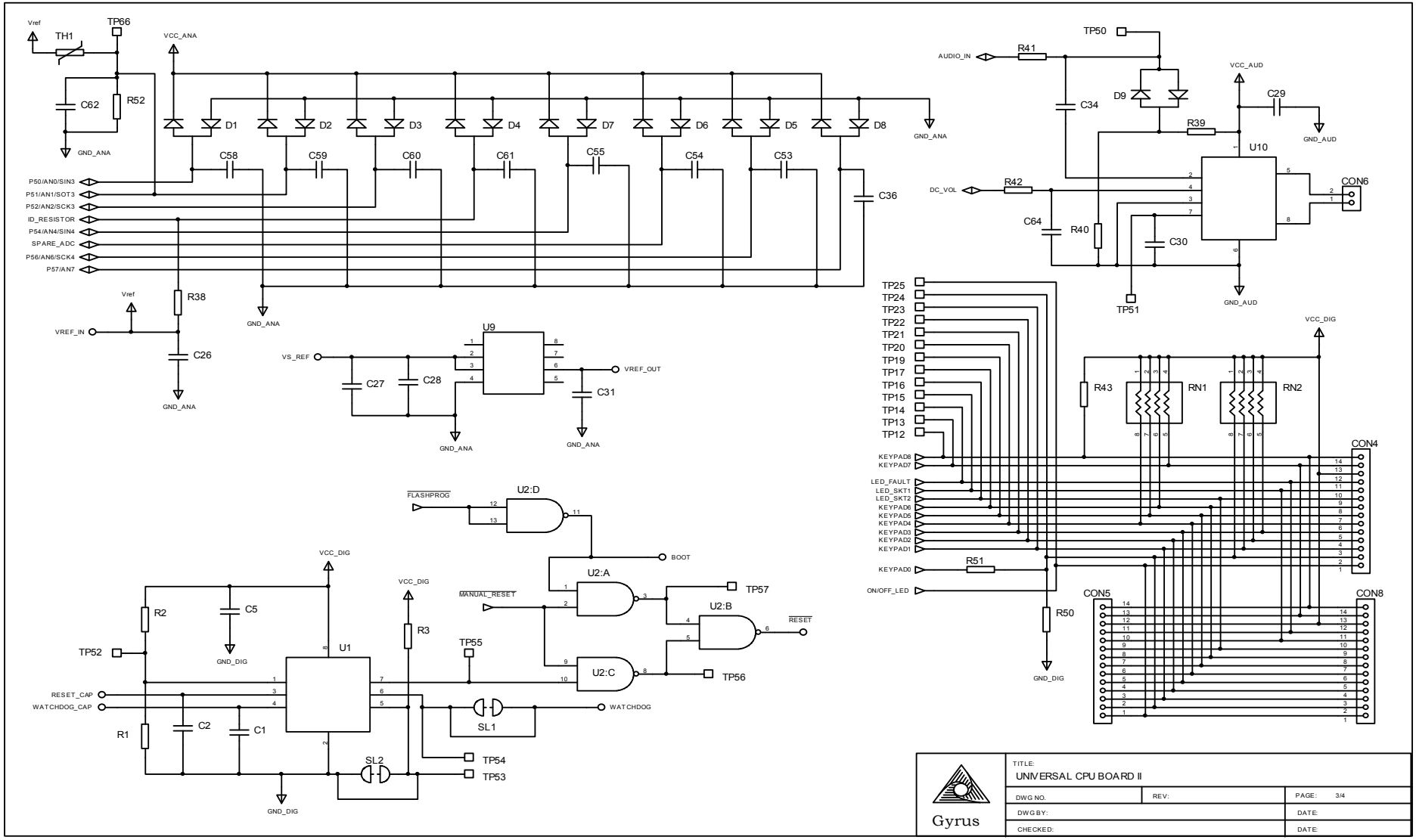
Electrical safety tester model number				
Electrical safety tester serial number				
Electrical safety tester calibration	Start date		Expiry date	
Biomedical Engineer details	Name		Signature	
Quality reviewer details	Name		Signature	

Section IX

Technical Reference Drawings




VCC_DIG
C18
GND_DIG
U7
SPI_SCLK
SPI_SOUT
SPI_SIN
EEPROM_CS
TP47
EEPROM_WP
R35
R34
TP48
R36
TP49
RESET
C37
R37
C33
U8
DAC_A
DAC_B
DAC_C
DAC_D
UPO
Vref
C32
GND_ANA
TP36
TP37
TP38
TP39
TP40
TP41
TP42
TP43
C50
U4
P06/AD06
P05/AD05
P22/A18
P45/SCK1
P20/A16
P21/A17
P92/T1N2/IN2
SPARE_OUTPUT1
R48
TP11
TP10
TP9
TP8
TP7
TP6
TP5
R44
R47
R45
C48
C43
U12
P55/AN5/SOT4
P80/IRQ0
P81/IRQ1
P33/WRHX
P37/CLK
P31/RDX
P30/ALE
P32/WRLX
C44
X2
C47
TP44
TP45
INTRN
TP34
TP35
R16
R9
U3:C
TP58
R33
R46
PA2
PA1
PA0
R8
R49
R4
R7
R14
U3:D
U3:E
U3:F
R19
ON/OFF_LED
P26/A22
R5
LED_FAULT
R6
LED_SKT1
R15
LED_SKT2
C38
CON1
R13
R12
R11
TITLE:
UNIVERSAL CPU BOARD II
DWG NO.
REV:
PAGE: 2/4
DWG BY:
DATE:
CHECKED:
DATE:
Gyrus


Vref
TH1
TP66
VCC_ANA
C62
R52
GND_ANA
D1
D2
D3
D4
D7
D6
D5
D8
C58
C59
C60
C61
C55
C54
C53
C36
P50/AN0/SIN3
P51/AN1/SOT3
P52/AN2/SCK3
ID_RESISTOR
P54/AN4/SIN4
SPARE_ADC
P56/AN6/SCK4
P57/AN7
Vref
R38
VREF_IN
C26
U9
VS_REF
C27
C28
VREF_OUT
C31
TP50
AUDIO_IN
R41
C34
D9
VCC_AUD
C29
GND_AUD
R39
U10
DC_VOL
R42
C64
R40
C30
CON6
TP51
TP25
TP24
TP23
TP22
TP21
TP20
TP19
TP17
TP16
TP15
TP14
TP13
TP12
VCC_DIG
R43
RN1
RN2
CON4
KEYPAD8
KEYPAD7
LED_FAULT
LED_SKT1
LED_SKT2
KEYPAD6
KEYPAD5
KEYPAD4
KEYPAD3
KEYPAD2
KEYPAD1
KEYPAD0
ON/OFF_LED
R51
R50
CON5
CON8
FLASHPROG
U2:D
BOOT
U2:A
TP57
MANUAL_RESET
U2:B
RESET
TP55
U2:C
TP56
VCC_DIG
R2
C5
TP52
U1
R3
RESET_CAP
WATCHDOG_CAP
WATCHDOG
SL1
R1
C2
C1
SL2
TP54
TP53
GND_DIG
Gyrus
TITLE:
UNIVERSAL CPU BOARD II
DWG NO.
REV:
PAGE: 3/4
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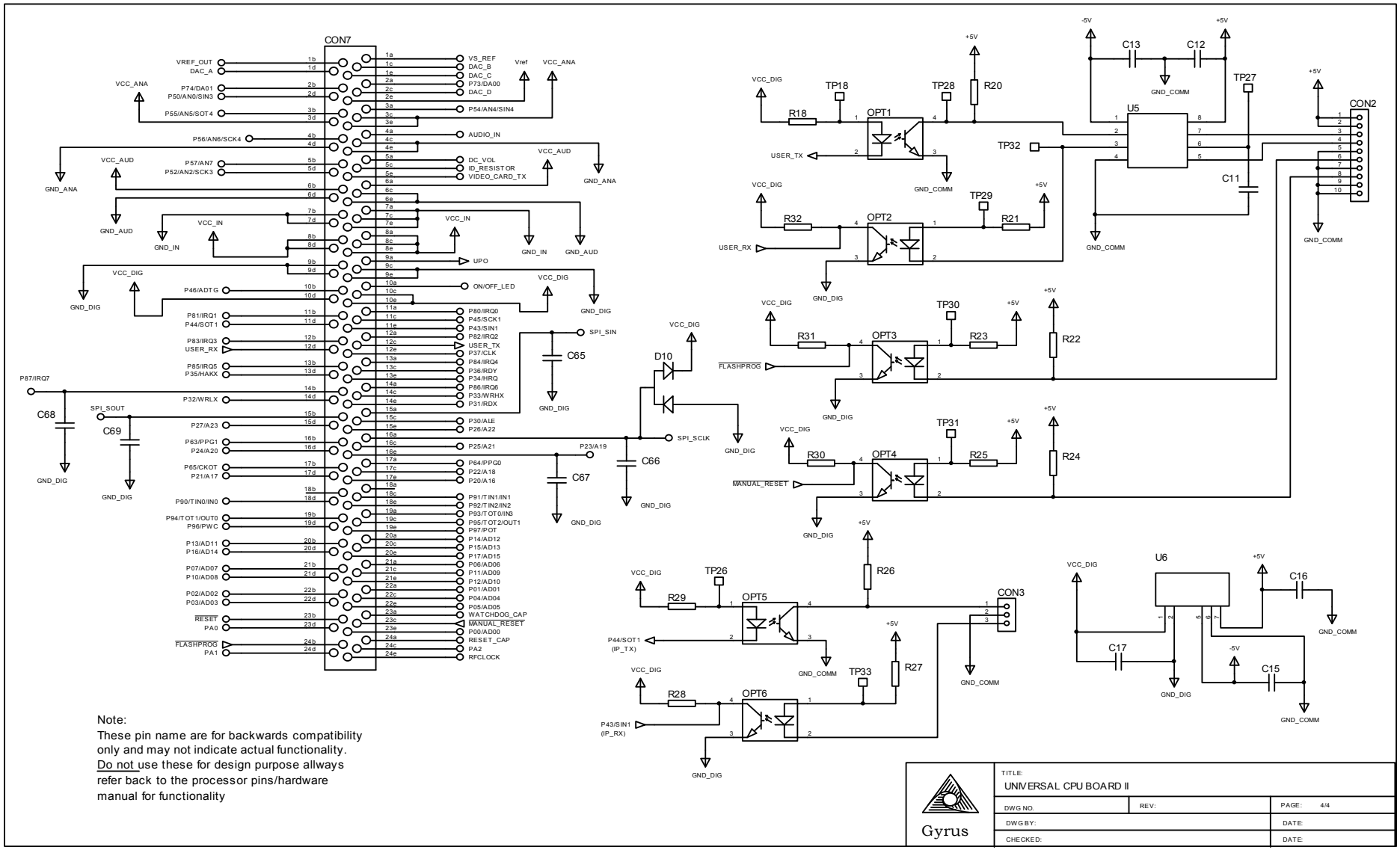
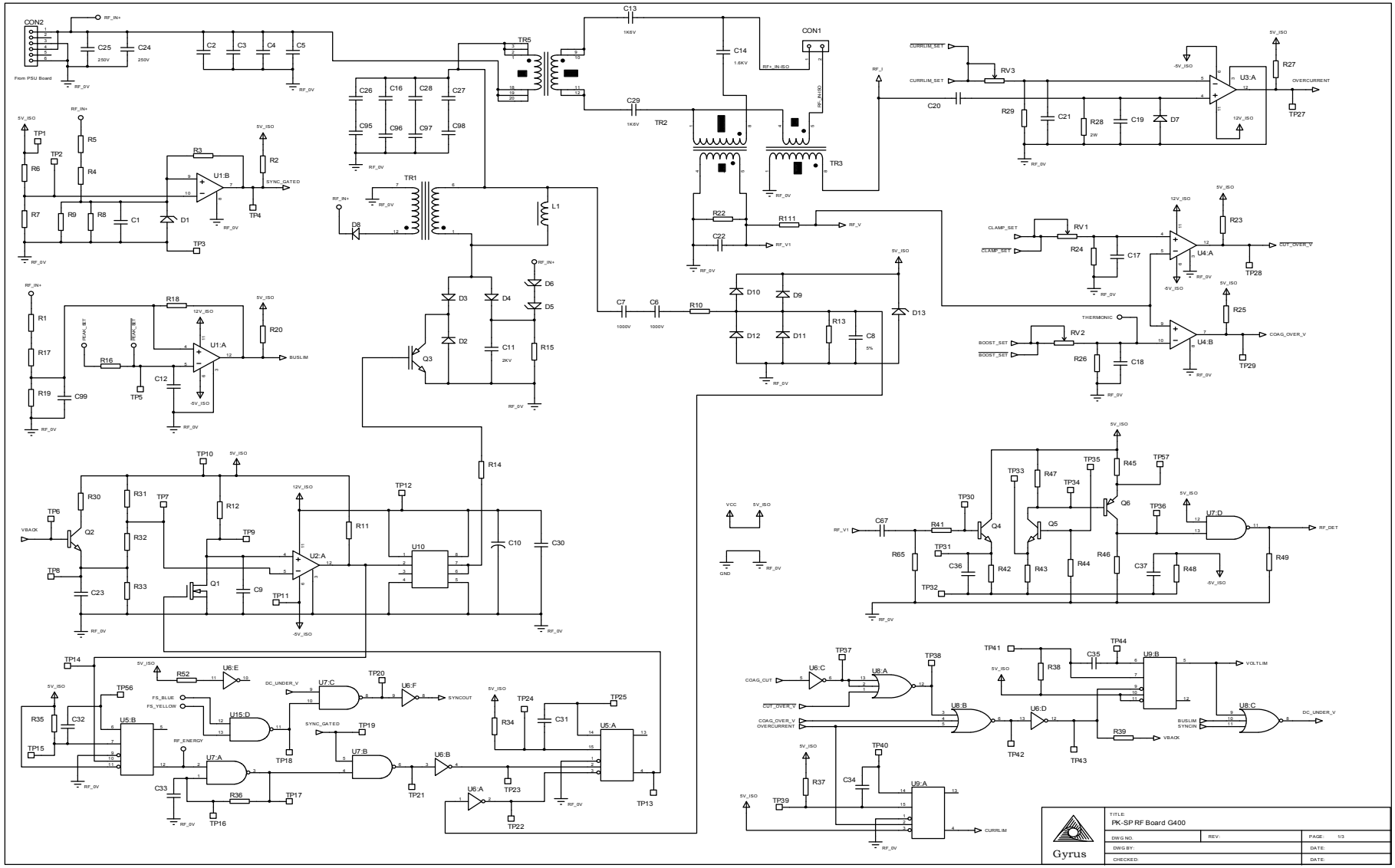
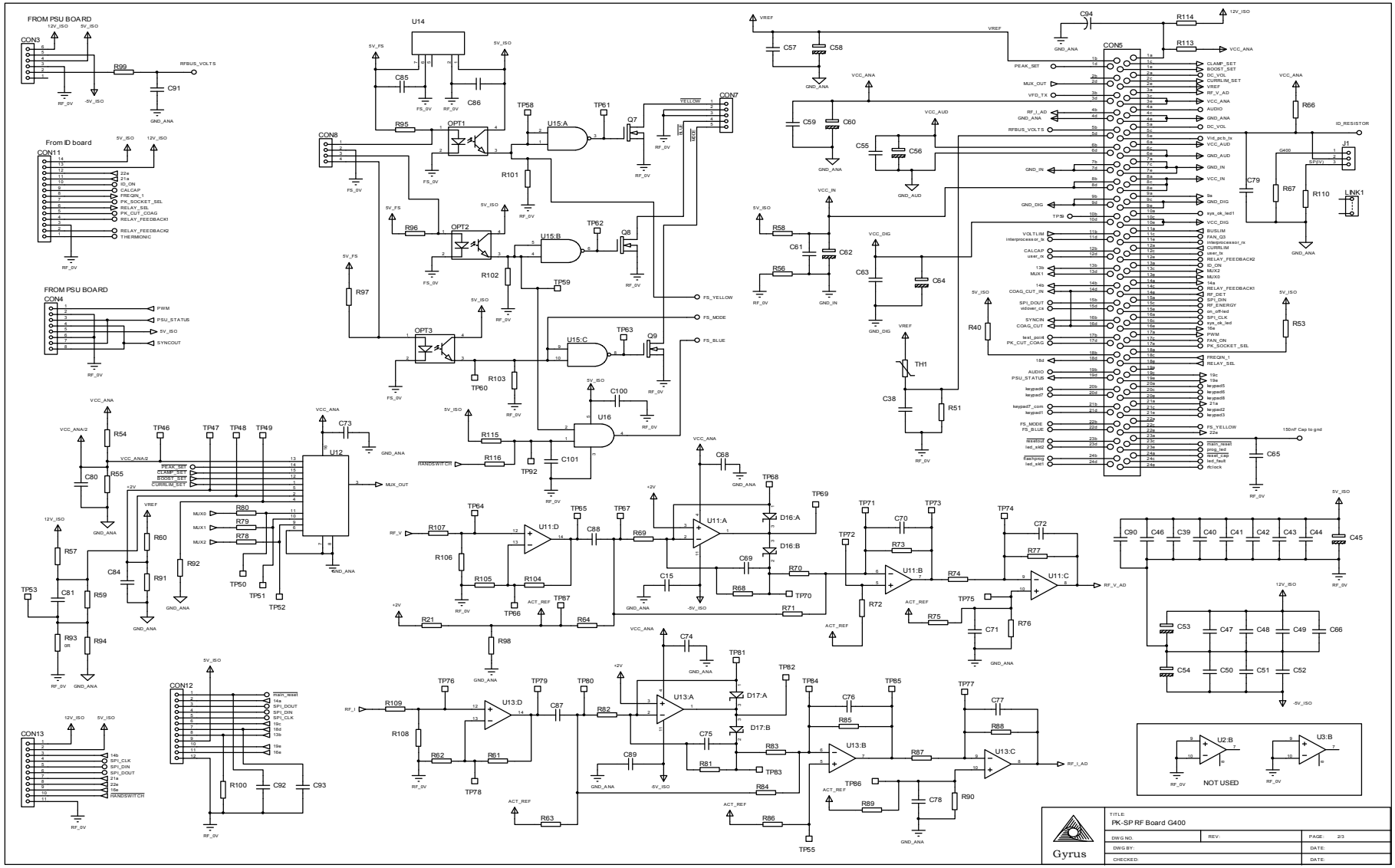
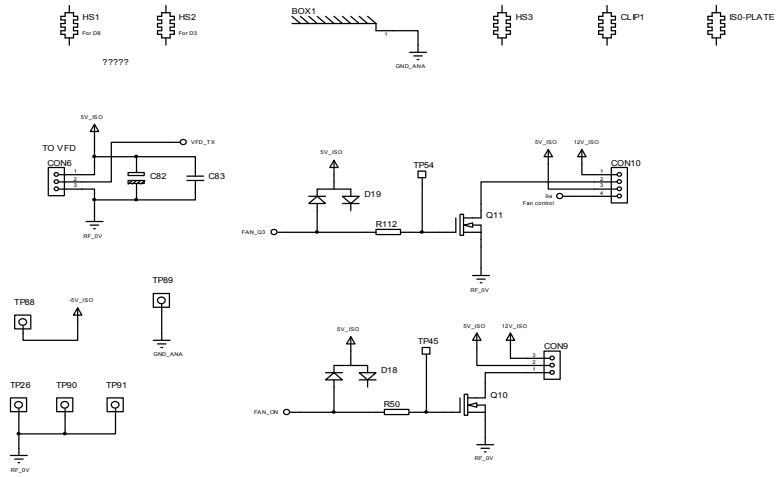
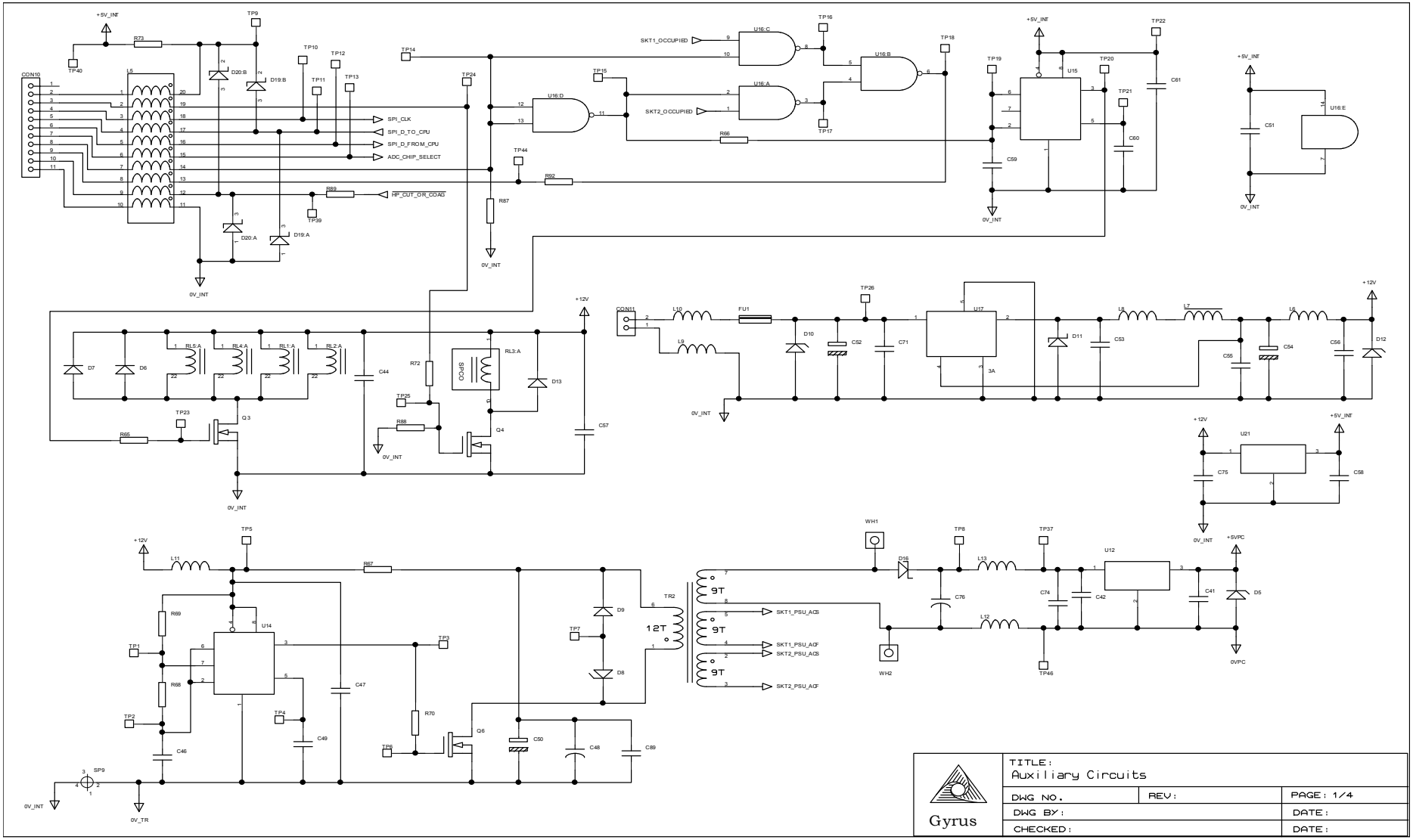

CON7
VREF_OUT
DAC_A
P74/DA01
P50/AN0/SIN3
P55/AN5/SOT4
P56/AN6/SCK4
P57/AN7
P52/AN2/SCK3
VS_REF
DAC_B
DAC_C
P73/DA00
DAC_D
P54/AN4/SIN4
AUDIO_IN
DC_VOL
ID_RESISTOR
VIDEO_CARD_TX
UPO
ON/OFF_LED
P46/ADTG
P81/IRQ1
P44/SOT1
P83/IRQ3
USER_RX
P85/IRQ5
P35/HAKX
P32/WRLX
P27/A23
P63/PPG1
P24/A20
P65/CKOT
P21/A17
P90/TIN0/IN0
P94/TOT1/OUT0
P96/PWC
P13/AD11
P16/AD14
P07/AD07
P10/AD08
P02/AD02
P03/AD03
RESET
PA0
FLASHPROG
PA1
P80/IRQ0
P45/SCK1
P43/SIN1
P82/IRQ2
USER_TX
P37/CLK
P84/IRQ4
P36/RDY
P34/HRQ
P86/IRQ6
P33/WRHX
P31/RDX
P30/ALE
P26/A22
P25/A21
P64/PPG0
P22/A18
P20/A16
P91/TIN1/IN1
P92/TIN2/IN2
P93/TOT0/IN3
P95/TOT2/OUT1
P97/POT
P14/AD12
P15/AD13
P17/AD15
P06/AD06
P11/AD09
P12/AD10
P01/AD01
P04/AD04
P05/AD05
WATCHDOG_CAP
MANUAL_RESET
P00/AD00
RESET_CAP
PA2
RFCLOCK
Vref
VCC_ANA
GND_ANA
VCC_AUD
GND_AUD
VCC_IN
GND_IN
VCC_DIG
GND_DIG
P87/IRQ7
C68
SPI_SOUT
C69
SPI_SIN
C65
D10
SPI_SCLK
P23/A19
C66
C67
TP18
TP28
R20
R18
OPT1
USER_TX
TP32
TP29
R32
OPT2
R21
USER_RX
TP30
R31
OPT3
R23
R22
FLASHPROG
TP31
R30
OPT4
R25
R24
MANUAL_RESET
TP26
R29
OPT5
R26
P44/SOT1
(IP_TX)
TP33
R27
R28
OPT6
P43/SIN1
(IP_RX)
CON3
C13
C12
GND_COMM
TP27
U5
C11
CON2
U6
C16
C17
C15
-5V
+5V
Note:
These pin name are for backwards compatibility only and may not indicate actual functionality.
Do not use these for design purpose allways refer back to the processor pins/hardware manual for functionality
Gyrus
TITLE:
UNIVERSAL CPU BOARD II
DWG NO.
REV:
PAGE: 4/4
DWG BY:
DATE:
CHECKED:
DATE:

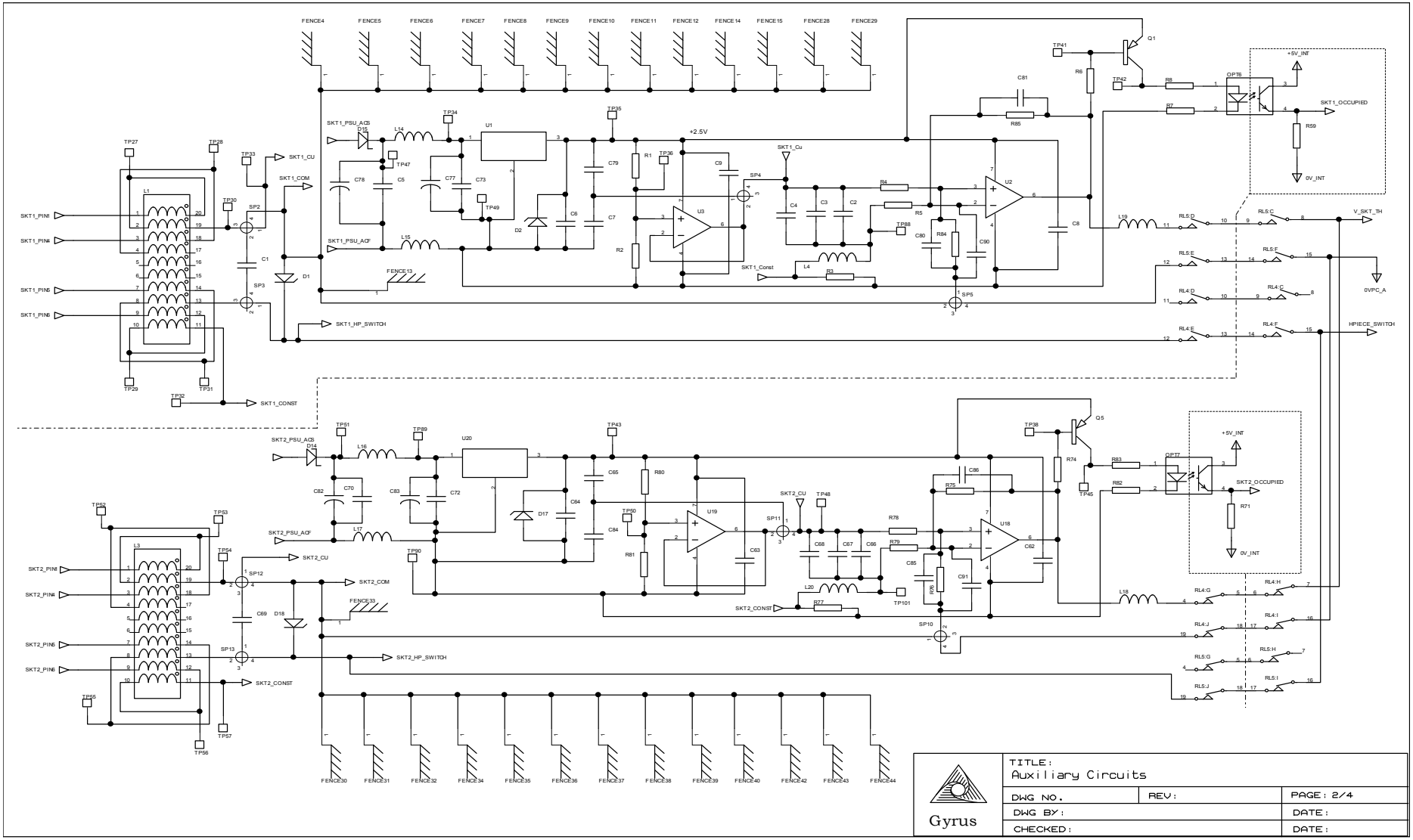

CON2
From PSU Board
RF_IN+
RF_0V
C25
C24
C2
C3
C4
C5
C13
C14
C29
TR5
TR2
TR3
CON1
RF+ IN-ISO
RF- IN-ISO
C26
C16
C28
C27
C95
C96
C97
C98
TR1
L1
D8
R22
R111
C22
RF_V
RF_V1
5V_ISO
TP1
TP2
TP3
TP4
R5
R6
R4
R7
R9
R8
C1
D1
R3
R2
U1:B
SYNC_GATED
C7
C8
R10
1000V
D10
D9
D12
D11
D13
R13
C8
5%
D3
D4
D2
C11
2KV
D6
D5
R15
Q3
R14
R18
12V_ISO
R20
BUSLIM
U1:A
R1
R17
R19
C99
R16
C12
TP5
-5V_ISO
REAL_SET
REQ_SET
TP10
TP12
R30
R31
R32
R33
TP6
TP7
TP8
TP9
Q2
Q1
C23
C9
R12
R11
U2:A
U10
C10
C30
TP11
TP14
TP56
R35
C32
TP15
U5:B
FS_BLUE
FS_YELLOW
RF_ENERGY
R52
U6:E
DC_UNDER_V
U7:C
TP20
U6:F
SYNCOUT
U15:D
TP18
SYNC_GATED
TP19
U7:B
U6:B
TP21
U7:A
C33
TP16
R36
TP17
TP24
R34
C31
TP25
U5:A
TP13
U6:A
TP23
TP22
CURRLIM_SET
RV3
C20
R29
C21
R28
2W
C19
D7
U3:A
R27
OVERCURRENT
TP27
CLAMP_SET
RV1
R24
C17
U4:A
R23
CUT_OVER_V
TP28
THERMONIC
RV2
BOOST_SET
R26
C18
U4:B
R25
COAG_OVER_V
TP29
VCC
GND
C67
R41
TP30
Q4
Q5
TP31
R65
C36
R42
R43
R44
R46
C37
R48
R49
TP32
TP33
R47
TP34
TP35
R45
TP57
Q6
TP36
U7:D
RF_DET
-5V_ISO
TP37
U6:C
COAG_CUT
U8:A
TP38
CUT_OVER_V
COAG_OVER_V
OVERCURRENT
U8:B
TP42
U6:D
TP43
TP41
C35
R38
U9:B
TP44
VOLTLIM
BUSLIM
SYNCIN
U8:C
DC_UNDER_V
R39
VBACK
TP40
R37
C34
U9:A
TP39
CURRLIM
TITLE:
PK-SP RF Board G400
DWG NO.
REV:
PAGE: 1/3
DWG BY:
DATE:
CHECKED:
DATE:
Gyrus

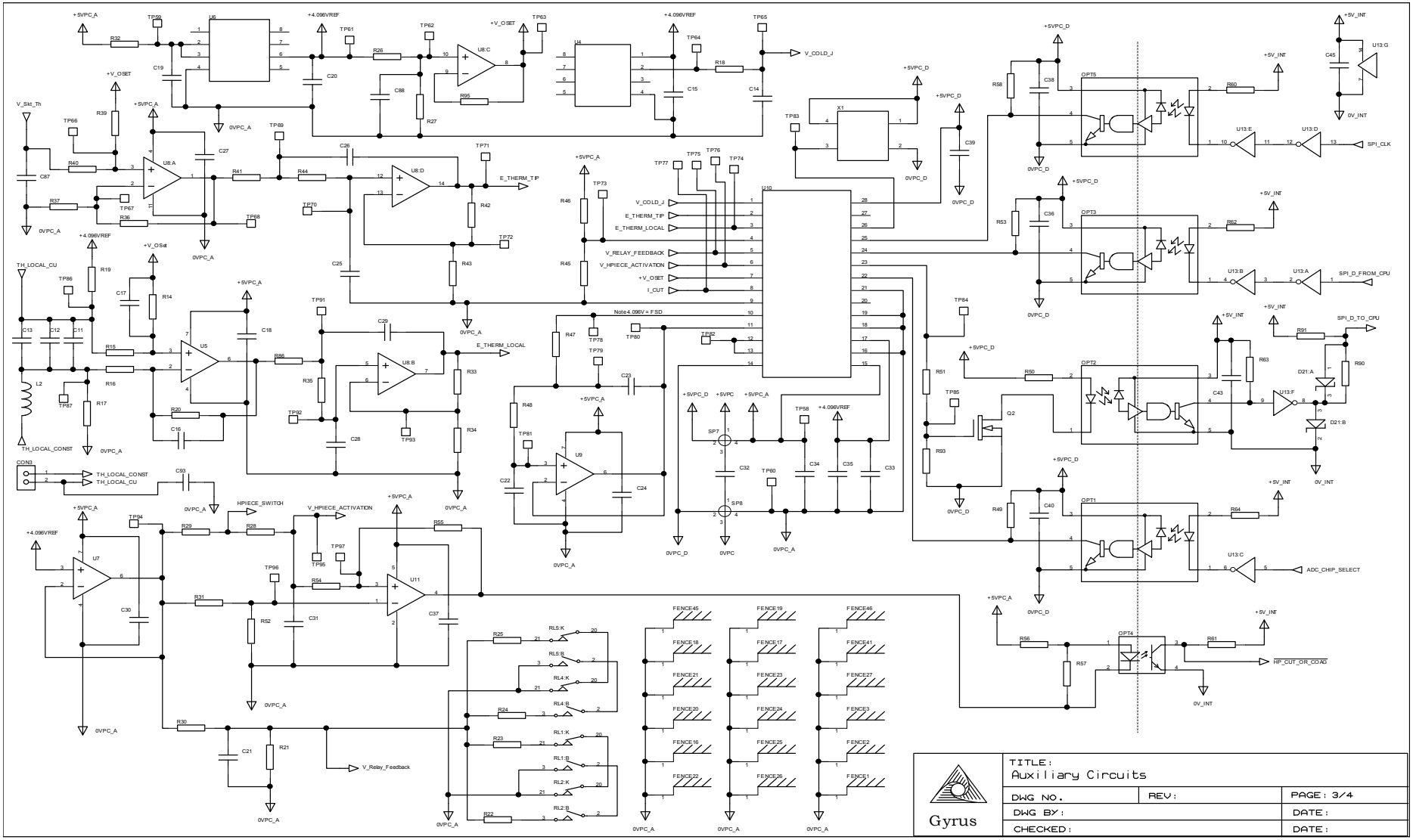

FROM PSU BOARD
CON3
R99
RFBUS_VOLTS
C91
From ID board
CON11
FROM PSU BOARD
CON4
PWM
PSU_STATUS
SYNCOUT
U14
OPT1
OPT2
OPT3
U15:A
U15:B
U15:C
U16
Q7
Q8
Q9
CON7
CON8
TP58
TP59
TP60
TP61
TP62
TP63
FS_YELLOW
FS_MODE
FS_BLUE
U12
MUX_OUT
HANDSWITCH
U11:A
U11:B
U11:C
U11:D
D16:A
D16:B
U13:A
U13:B
U13:C
U13:D
D17:A
D17:B
U2:B
U3:B
NOT USED
CON5
CON12
CON13
LINK1
J1
TH1
TP55
Gyrus
TITLE:
PK-SP RF Board G400
DWG NO.
REV:
PAGE: 2/3
DWG BY:
DATE:
CHECKED:
DATE:

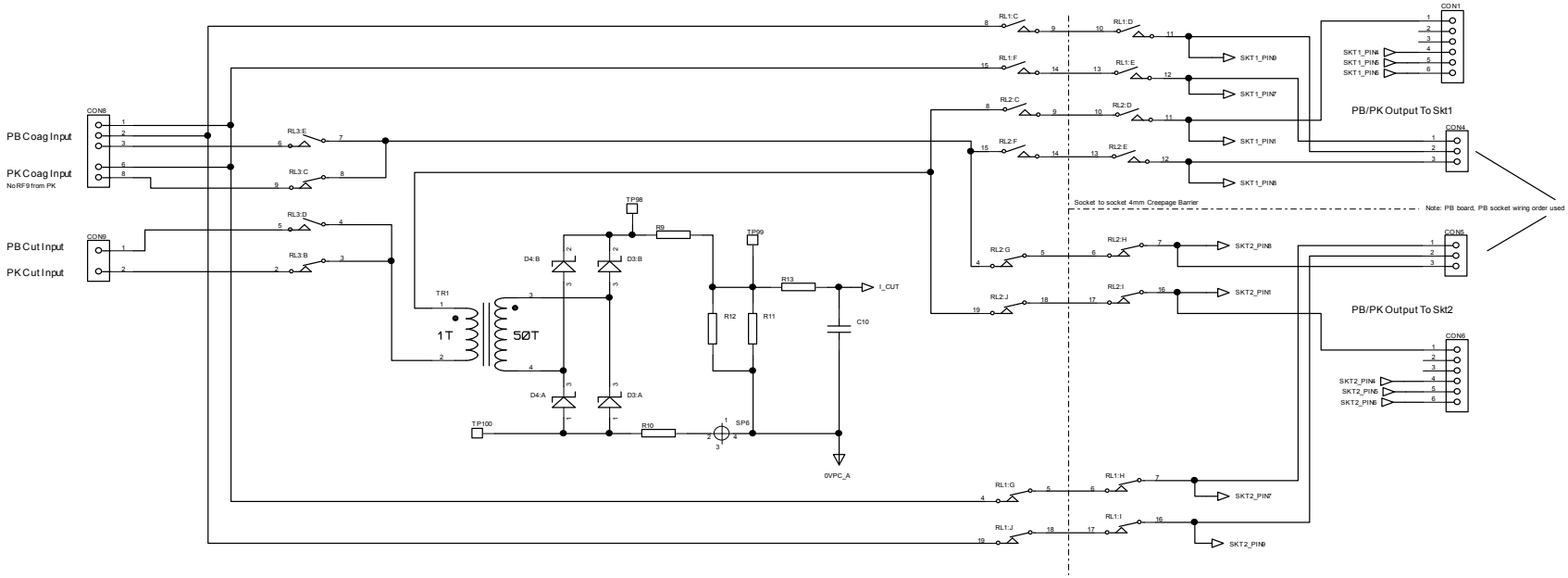


Gyrus	TITLE: PK-SP RF Board G400	
	DWG NO.	REV: PAGE: 3/3
	DWG BY:	DATE:
	CHECKED:	DATE:

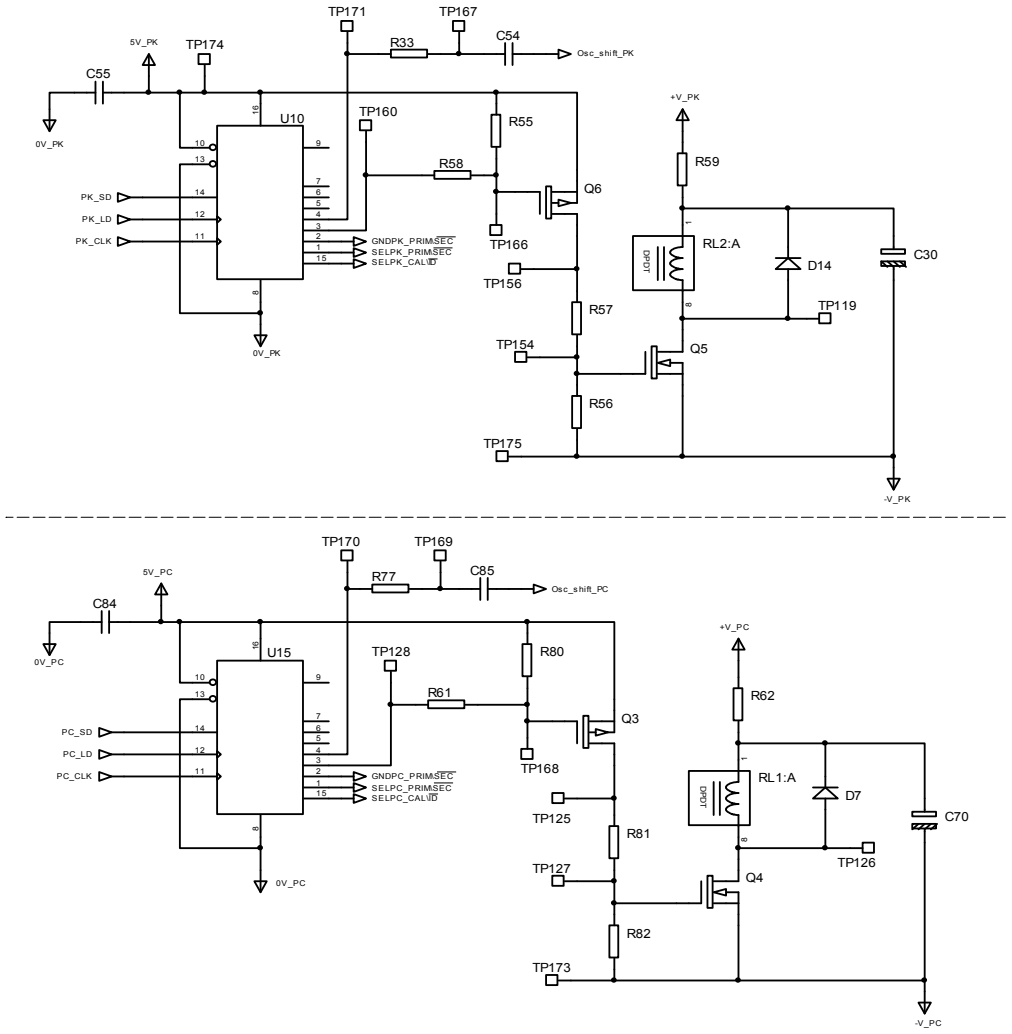

+5V_INT
+12V
0V_INT
0V_TR
0VPC
+5VPC
CON10
CON11
SPI_CLK
SPI_D_TO_CPU
SPI_D_FROM_CPU
ADC_CHIP_SELECT
HP_CUT_OR_COAG
SKT1_OCCUPIED
SKT2_OCCUPIED
SKT1_PSU_ACS
SKT2_PSU_ACS
U16:A
U16:B
U16:C
U16:D
U16:E
U14
U15
U17
U21
TR2
12T
9T
Q3
Q4
Q6
RL1:A
RL2:A
RL3:A
RL4:A
RL5:A
COAG
3A
TITLE:
Auxiliary Circuits
DWG NO.
REV:
PAGE: 1/4
DWG BY:
DATE:
CHECKED:
DATE:
Gyrus


FENCE4
FENCE5
FENCE6
FENCE7
FENCE8
FENCE9
FENCE10
FENCE11
FENCE12
FENCE14
FENCE15
FENCE28
FENCE29
SKT1_PSU_ACS
SKT1_PSU_ACF
SKT1_CU
SKT1_COM
SKT1_CONST
SKT1_HP_SWITCH
SKT1_Cu
SKT1_Const
SKT1_OCCUPIED
+2.5V
+5V_INT
0V_INT
V_SKT_TH
0VPC_A
HPIECE_SWITCH
SKT2_PSU_ACS
SKT2_PSU_ACF
SKT2_CU
SKT2_COM
SKT2_CONST
SKT2_HP_SWITCH
SKT2_CONSST
SKT2_OCCUPIED
FENCE13
FENCE30
FENCE31
FENCE32
FENCE34
FENCE35
FENCE36
FENCE37
FENCE38
FENCE39
FENCE40
FENCE42
FENCE43
FENCE44
TITLE:
Auxiliary Circuits
DWG NO.
REV:
PAGE: 2/4
DWG BY:
DATE:
CHECKED:
DATE:
Gyrus

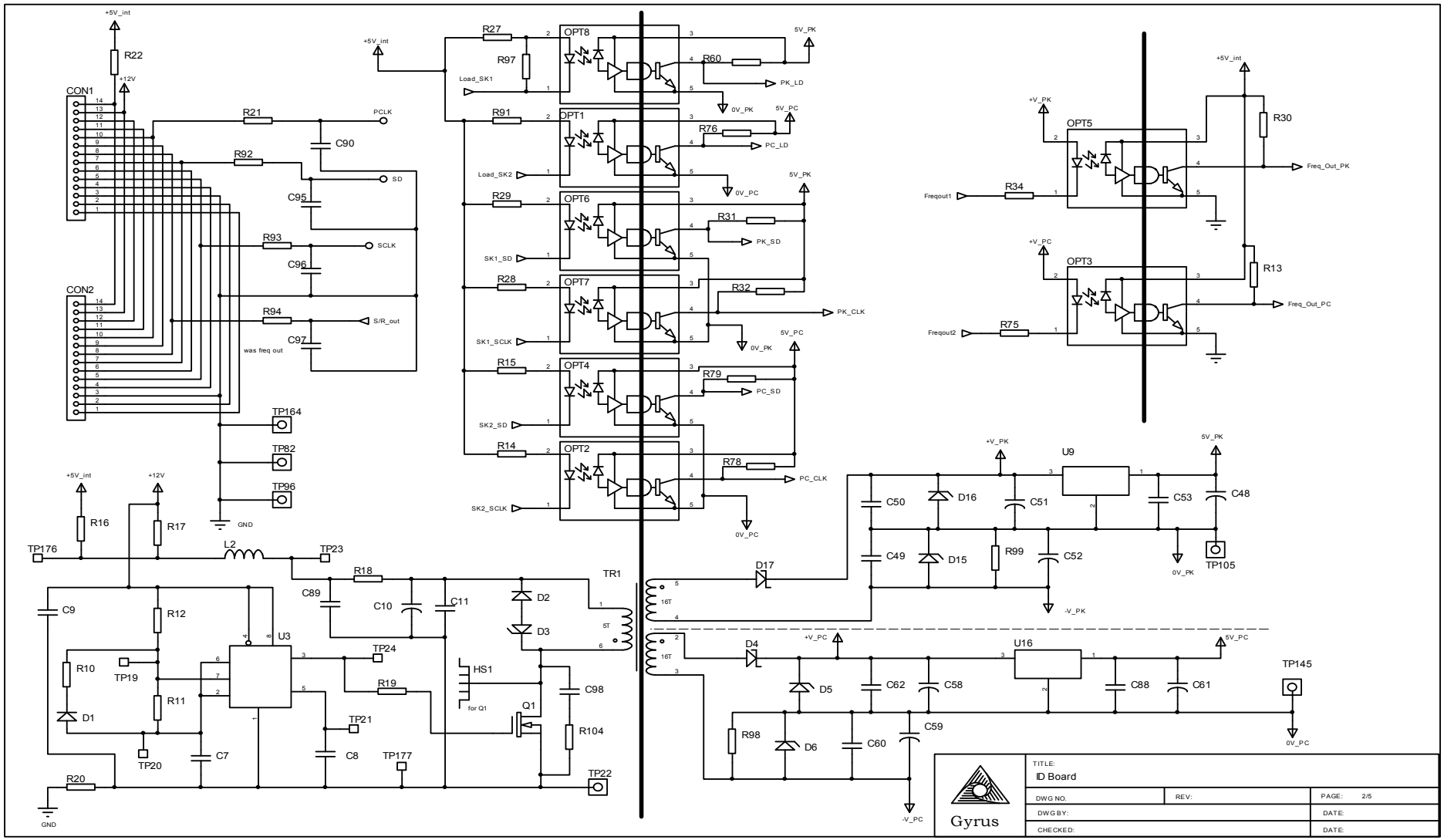

TITLE:
Auxiliary Circuits
DWG NO.
REV:
PAGE: 3/4
DWG BY:
DATE:
CHECKED:
DATE:
Gyrus
V_COLD_J
E_THERM_TIP
E_THERM_LOCAL
V_RELAY_FEEDBACK
V_HPIECE_ACTIVATION
I_CUT
SPI_CLK
SPI_D_FROM_CPU
SPI_D_TO_CPU
ADC_CHIP_SELECT
HP_CUT_OR_COAG
TH_LOCAL_CU
TH_LOCAL_CONST
HPIECE_SWITCH
V_Relay_Feedback
Note 4.096V = FSD

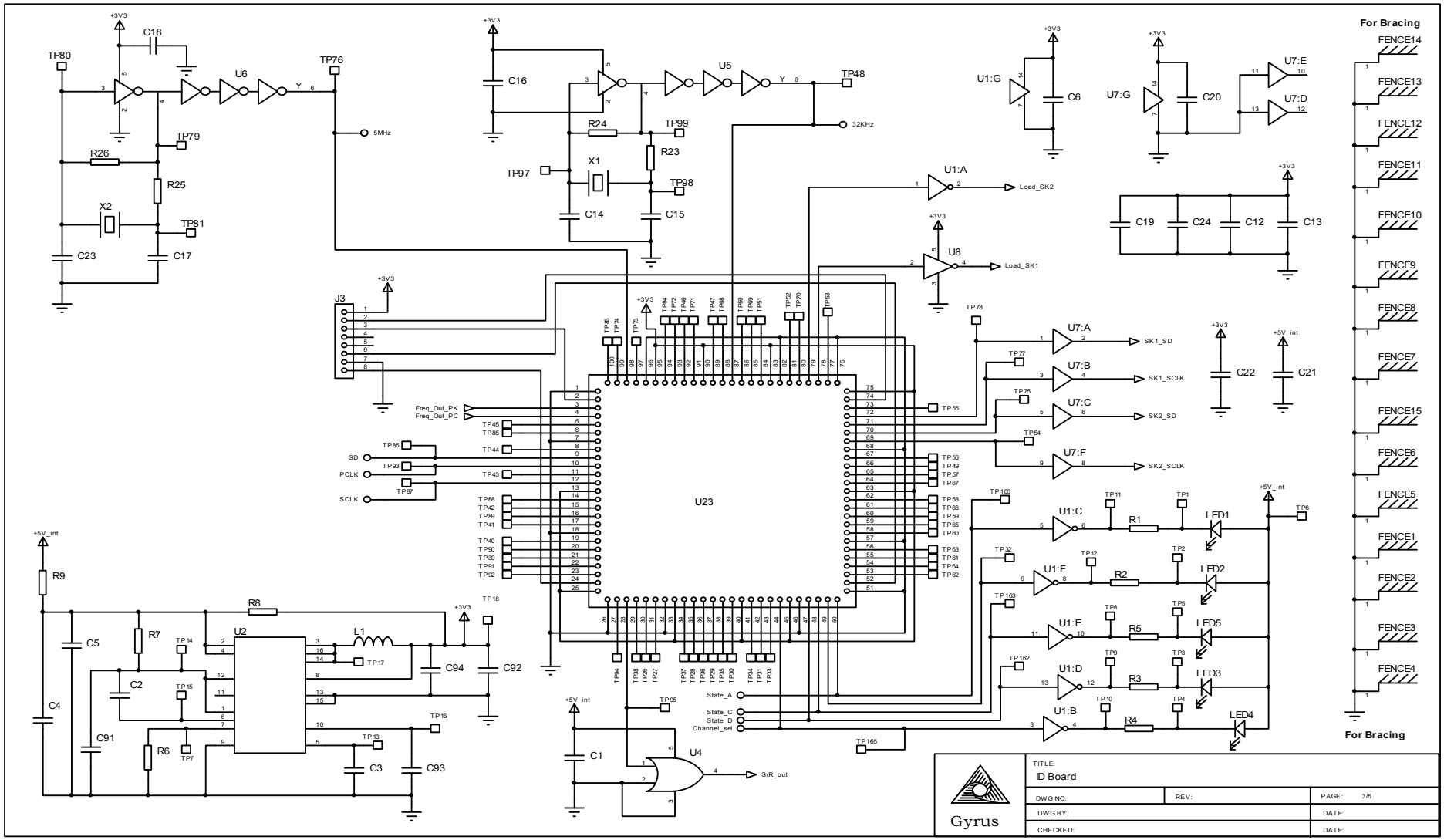


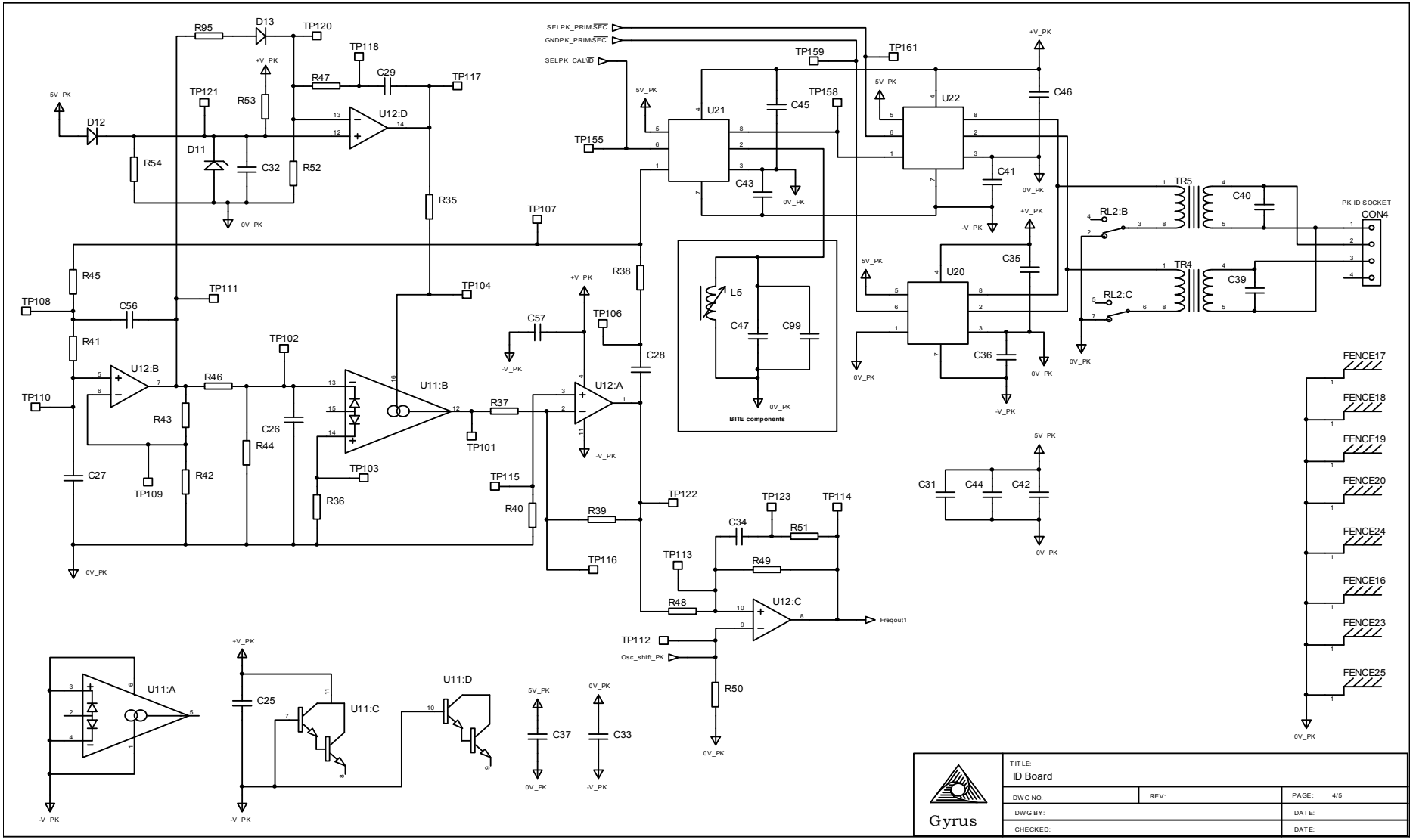
Gyrus	TITLE: Auxiliary Circuits		
	DWG NO.	REV:	PAGE: 4/4
	DWG BY:		DATE:
	CHECKED:		DATE:

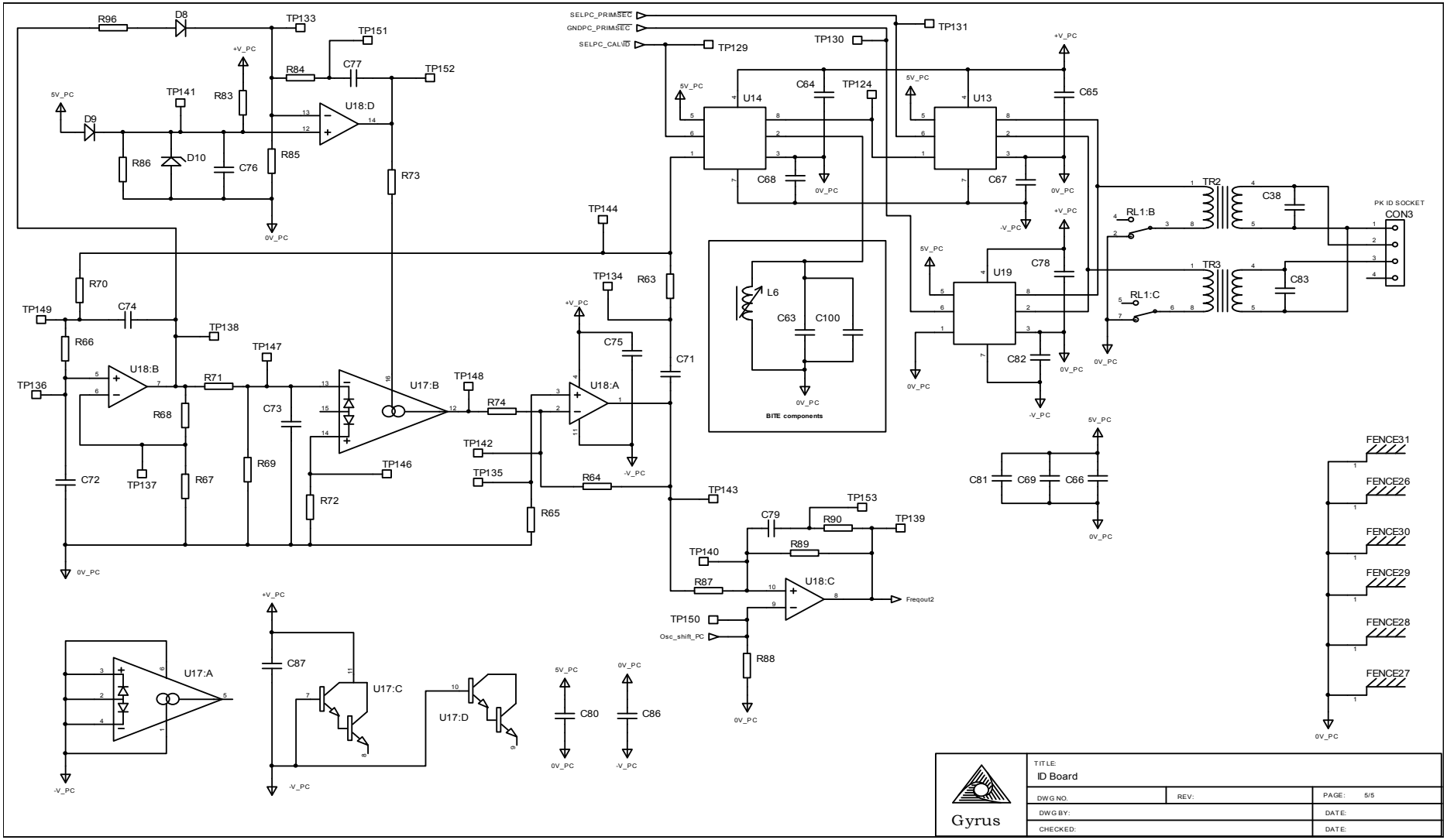


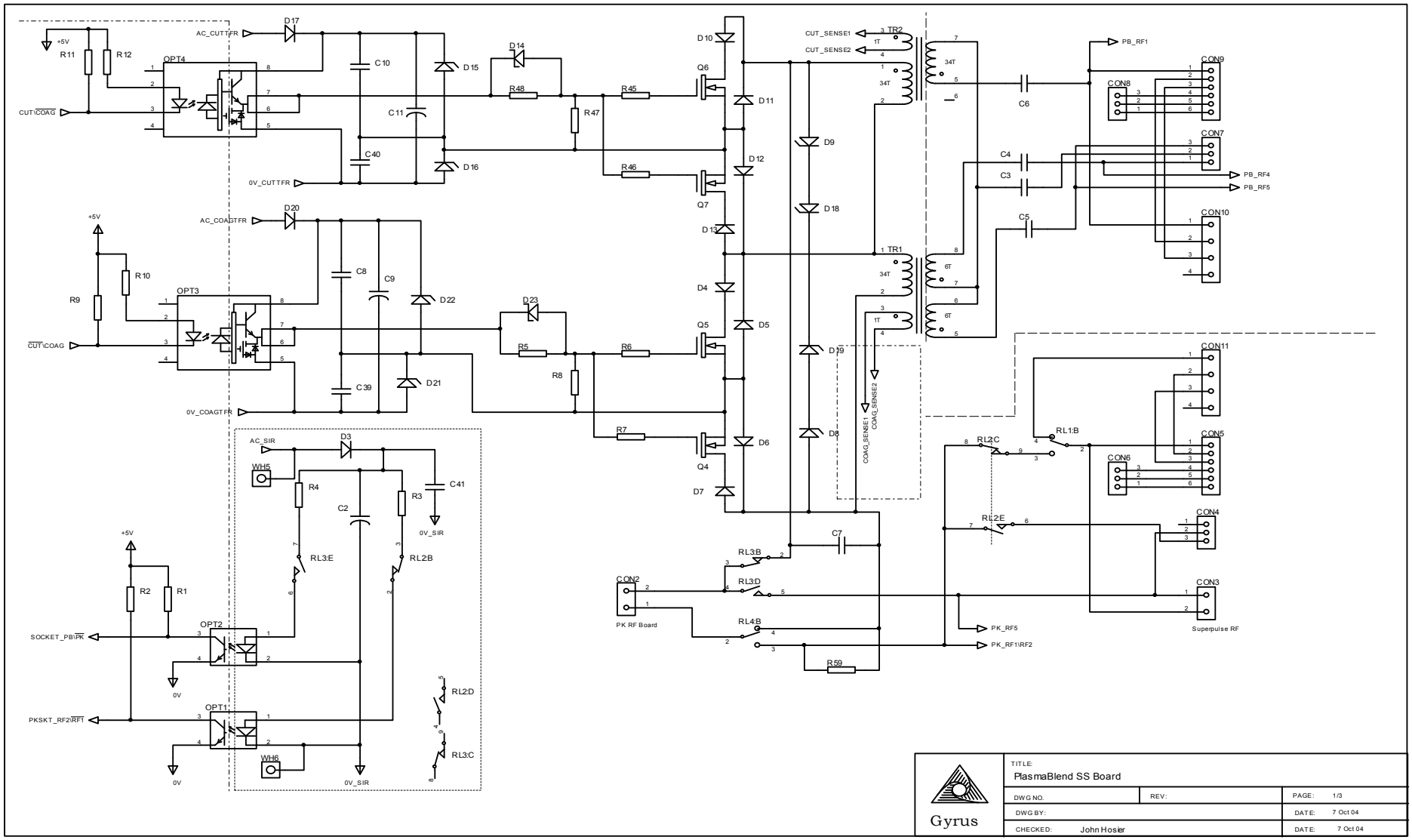
Gyrus	TITLE: ID Board		
	DWG NO.	REV:	PAGE: 1/5
	DWG BY:		DATE:
	CHECKED:		DATE:

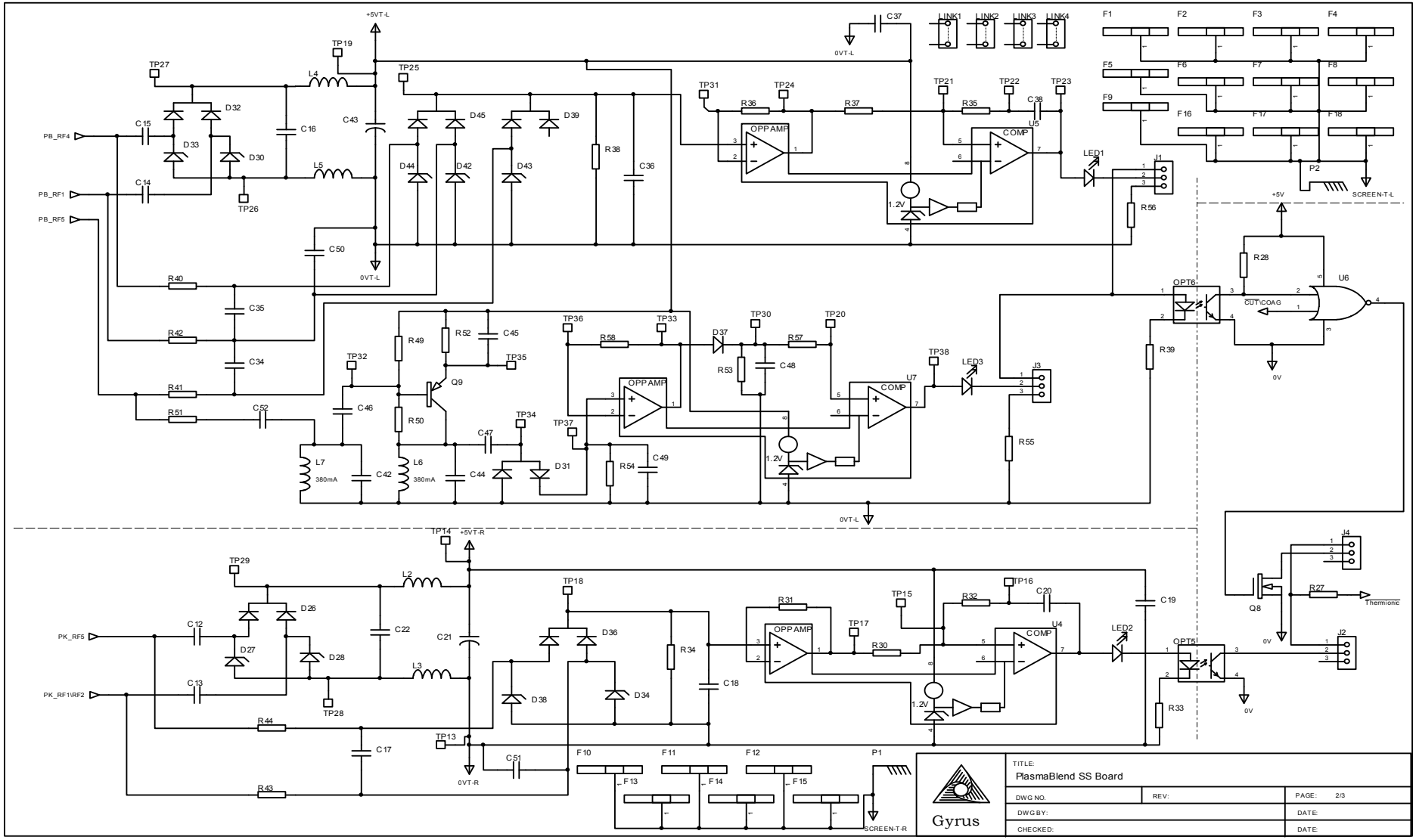

+5V_int
R22
+12V
CON1
R21
PCLK
C90
R92
SD
C95
R93
SCLK
C96
CON2
R94
S/R_out
C97
was freq out
TP164
TP82
TP96
GND
R27
R97
Load_SK1
OPT8
R60
5V_PK
PK_LD
0V_PK
R91
OPT1
R76
5V_PC
PC_LD
Load_SK2
0V_PC
R29
OPT6
R31
PK_SD
SK1_SD
R28
OPT7
R32
PK_CLK
SK1_SCLK
R15
OPT4
R79
PC_SD
SK2_SD
R14
OPT2
R78
PC_CLK
SK2_SCLK
+V_PK
OPT5
R30
Freq_Out_PK
Freqout1
R34
+V_PC
OPT3
R13
Freq_Out_PC
Freqout2
R75
U9
C50
D16
C51
C53
C48
C49
D15
R99
C52
TP105
D17
-V_PK
TR1
16T
5T
R16
R17
TP176
L2
TP23
R18
C89
C10
C11
D2
D3
C9
R12
U3
TP24
R10
TP19
R11
D1
TP20
C7
R19
HS1
for Q1
Q1
C98
R104
TP21
C8
TP177
TP22
R20
GND
D4
D5
C62
C58
U16
C88
C61
TP145
R98
D6
C60
C59
-V_PC
Gyrus
TITLE:
ID Board
DWG NO.
REV:
PAGE: 2/5
DWG BY:
DATE:
CHECKED:
DATE:

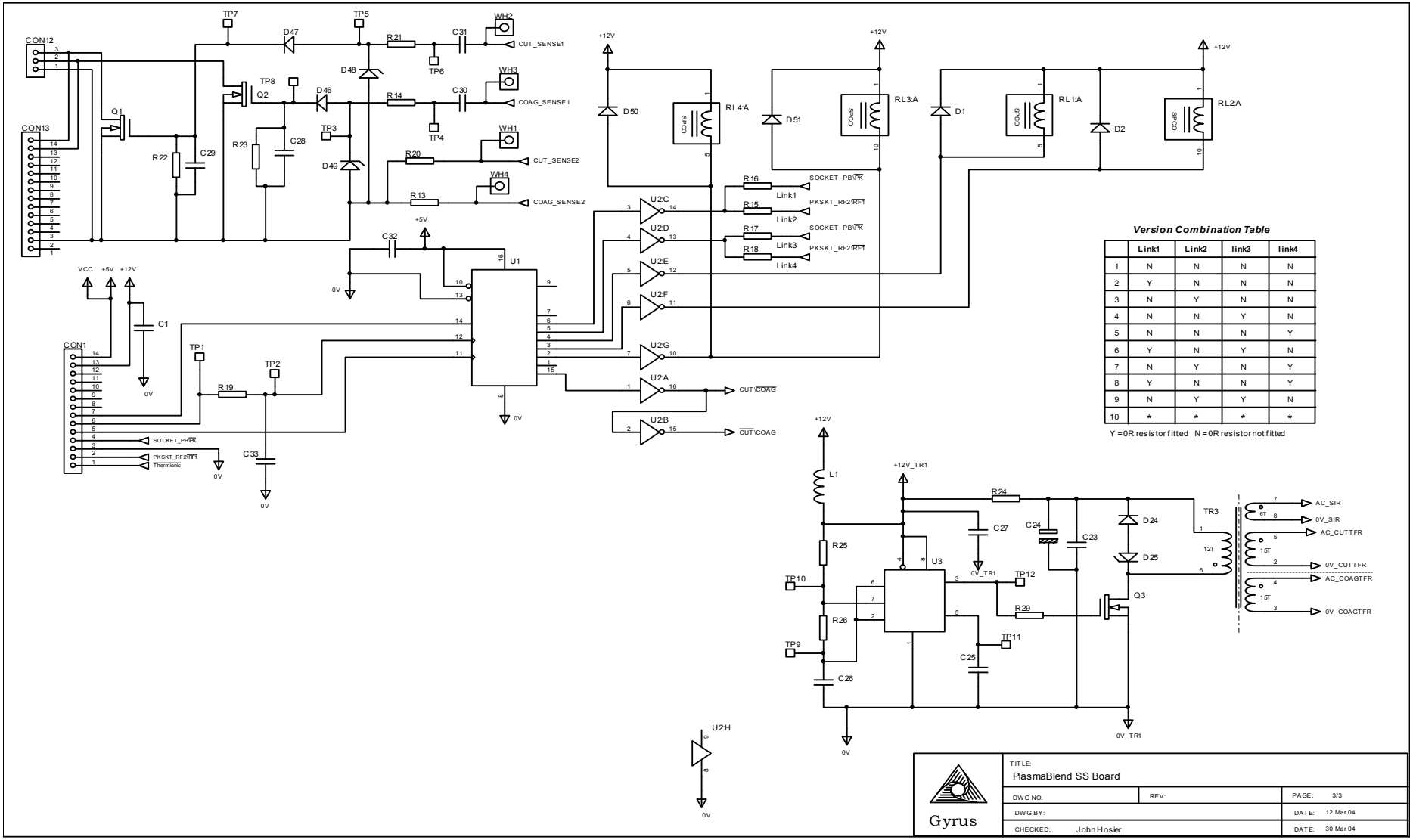

For Bracing
FENCE14
FENCE13
FENCE12
FENCE11
FENCE10
FENCE9
FENCE8
FENCE7
FENCE15
FENCE6
FENCE5
FENCE1
FENCE2
FENCE3
FENCE4
For Bracing
U23
U6
U5
U1:A
U1:G
U7:G
U7:E
U7:D
U8
U7:A
U7:B
U7:C
U7:F
U1:C
U1:F
U1:E
U1:D
U1:B
U2
U4
X1
X2
C18
C16
C6
C20
C19
C24
C12
C13
C14
C15
C23
C17
C22
C21
C5
C4
C2
C91
C94
C92
C93
C3
C1
R9
R8
R7
R6
R26
R25
R24
R23
R1
R2
R5
R3
R4
LED1
LED2
LED5
LED3
LED4
L1
J3
TP80
TP76
TP79
TP81
TP99
TP97
TP98
TP48
TP78
TP77
TP75
TP54
TP55
TP100
TP32
TP163
TP162
TP165
TP95
TP18
TP16
TP13
TP14
TP15
TP17
TP7
Load_SK2
Load_SK1
SK1_SD
SK1_SCLK
SK2_SD
SK2_SCLK
Freq_Out_PK
Freq_Out_PC
SD
PCLK
SCLK
State_A
State_C
State_D
Channel_sel
S/R_out
5MHz
32KHz
+3V3
+5V_int
Gyrus
TITLE:
ID Board
DWG NO.
REV:
PAGE: 3/5
DWG BY:
DATE:
CHECKED:
DATE:


R95
D13
TP120
TP118
TP121
R53
R47
C29
TP117
U12:D
D12
D11
R54
C32
R52
R35
TP107
SELPK_PRIM/SEC
GNDPK_PRIM/SEC
SELPK_CAL/D
TP159
TP161
TP158
C45
U21
U22
C46
TP155
C43
C41
TP5
C40
RL2:B
PK ID SOCKET
CON4
TP4
C39
RL2:C
U20
C35
L5
C47
C99
C36
BITE components
R45
TP108
C56
TP111
TP104
R38
C57
TP106
C28
R41
TP102
U12:B
U11:B
U12:A
TP110
R46
R37
R43
C26
R44
TP101
C27
TP109
R42
TP103
R36
TP115
R40
R39
TP122
TP123
TP114
C34
R51
TP113
R49
R48
U12:C
Freqout1
TP112
Osc_shift_PK
R50
C31
C44
C42
FENCE17
FENCE18
FENCE19
FENCE20
FENCE24
FENCE16
FENCE23
FENCE25
U11:A
C25
U11:C
U11:D
C37
C33
5V_PK
0V_PK
+V_PK
-V_PK
Gyrus
TITLE:
ID Board
DWG NO.
REV:
PAGE: 4/5
DWG BY:
DATE:
CHECKED:
DATE:


R96
D8
TP133
TP151
TP152
C77
R84
+V_PC
TP141
R83
5V_PC
D9
U18:D
R86
D10
C76
R85
R73
0V_PC
SELPC_PRIMSEC
GNDPC_PRIMSEC
SELPC_CALID
TP131
TP130
TP129
U14
U13
C64
TP124
C65
C68
C67
TP144
TP134
R63
L6
C63
C100
BITE components
C78
U19
C82
TR2
TR3
C38
C83
RL1:B
RL1:C
PK ID SOCKET
CON3
R70
TP149
C74
TP138
R66
TP147
TP136
U18:B
R71
U17:B
TP148
R74
U18:A
C75
C71
R68
C73
TP142
TP135
TP146
R64
C72
TP137
R67
R69
R72
R65
TP143
TP153
C79
R90
TP139
R89
TP140
R87
U18:C
Freqout2
TP150
Osc_shift_PC
R88
C81
C69
C66
FENCE31
FENCE26
FENCE30
FENCE29
FENCE28
FENCE27
U17:A
C87
U17:C
U17:D
C80
C86
-V_PC
Gyrus
TITLE:
ID Board
DWG NO.
REV:
PAGE: 5/5
DWG BY:
DATE:
CHECKED:
DATE:


AC_CUTTFR
D17
R11
R12
OPT4
CUT\COAG
C10
C11
C40
D15
D16
D14
R48
R47
R45
R46
D10
Q6
Q7
D11
D12
0V_CUTTFR
CUT_SENSE1
CUT_SENSE2
TR2
34T
1T
C6
C4
C3
C5
PB_RF1
PB_RF4
PB_RF5
CON8
CON9
CON7
CON10
D9
D18
D13
TR1
6T
AC_COAGTFR
D20
R10
R9
OPT3
C8
C9
C39
D22
D21
D23
R5
R6
R8
D4
D5
Q5
D19
0V_COAGTFR
COAG_SENSE1
COAG_SENSE2
CON11
RL1:B
RL2:C
CON6
CON5
CON4
RL2:E
AC_SIR
D3
WH5
R4
R3
C41
C2
0V_SIR
RL3:E
RL2:B
R7
D6
Q4
D7
D8
C7
RL3:B
RL3:D
RL4:B
CON2
PK RF Board
CON3
Superpulse RF
PK_RF5
PK_RF1\RF2
R59
R2
R1
OPT2
SOCKET_PB\PK
0V
OPT1
PKSKT_RF2\RFT
RL2:D
RL3:C
WH6
Gyrus
TITLE:
PlasmaBlend SS Board
DWG NO.
REV:
PAGE: 1/3
DWG BY:
DATE: 7 Oct 04
CHECKED: John Hosier
DATE: 7 Oct 04


+5VT-L
0VT-L
TP19
TP27
TP25
L4
L5
C43
C16
C15
C14
D32
D33
D30
TP26
PB_RF4
PB_RF1
PB_RF5
D45
D44
D42
D43
D39
R38
C36
C50
R40
C35
R42
C34
R41
R51
C52
TP31
TP24
R36
R37
OPP AMP
TP21
TP22
TP23
R35
C38
U5
COMP
1.2V
C37
LINK1
LINK2
LINK3
LINK4
LED1
J1
R56
F1
F2
F3
F4
F5
F6
F7
F8
F9
F16
F17
F18
P2
SCREEN-T-L
+5V
R28
U6
OPT6
CUT\COAG
0V
R39
R49
R52
C45
TP32
TP35
Q9
R50
C46
C47
TP34
L7
380mA
L6
380mA
C42
C44
D31
TP36
TP33
R58
TP37
R54
C49
D37
TP30
TP20
R57
R53
C48
TP38
LED3
J3
R55
U7
TP14
+5VT-R
TP29
L2
L3
C22
C21
D26
D27
D28
C12
C13
PK_RF5
PK_RF1\RF2
TP28
R44
C17
R43
TP18
D36
D38
D34
R34
C18
TP13
0VT-R
C51
R31
TP17
TP15
R32
C20
C19
R30
U4
LED2
OPT5
R33
J4
Q8
R27
Thermionc
J2
F10
F11
F12
F13
F14
F15
P1
SCREEN-T-R
Gyrus
TITLE:
PlasmaBlend SS Board
DWG NO.
REV:
PAGE: 2/3
DWG BY:
DATE:
CHECKED:
DATE:

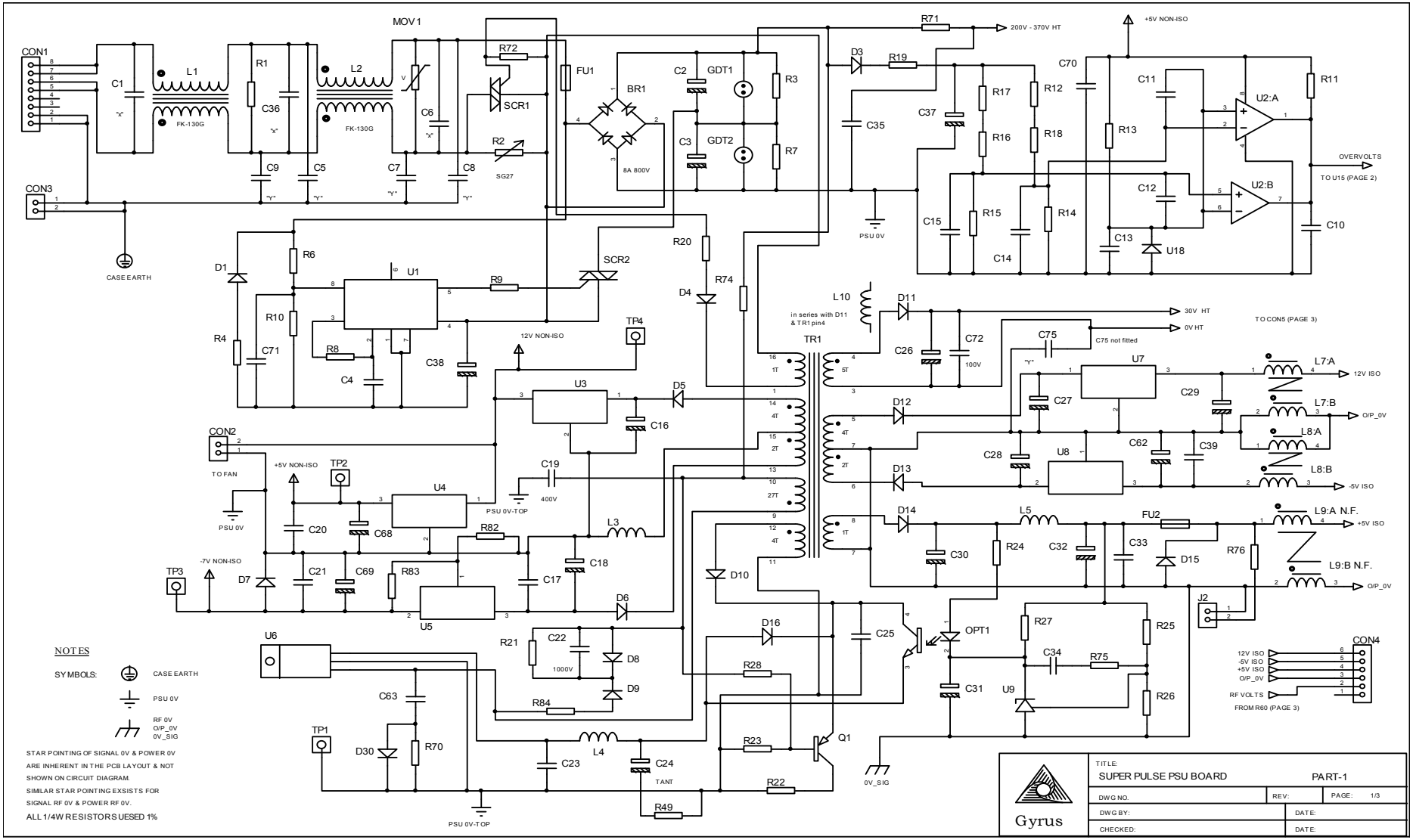


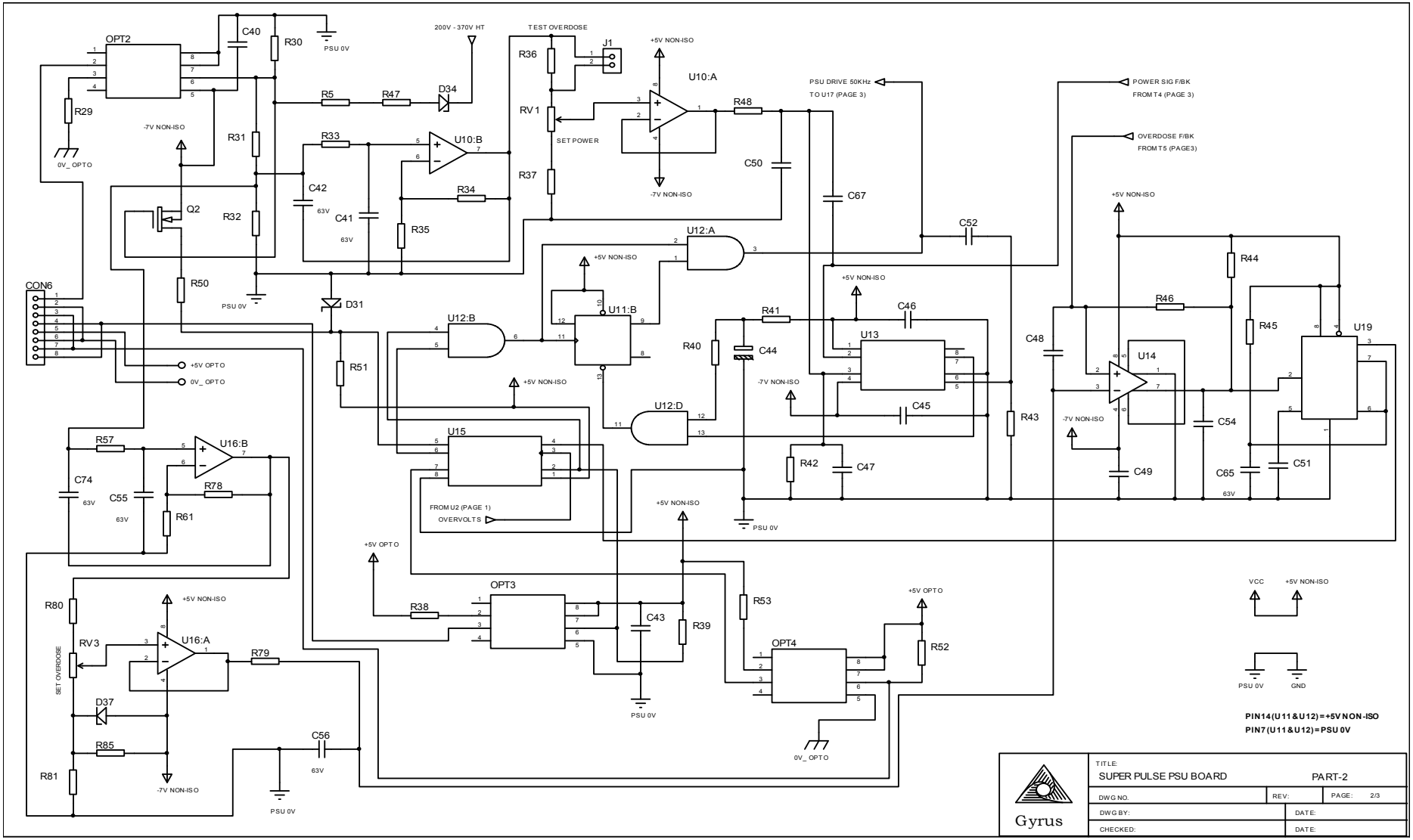
Version Combination Table

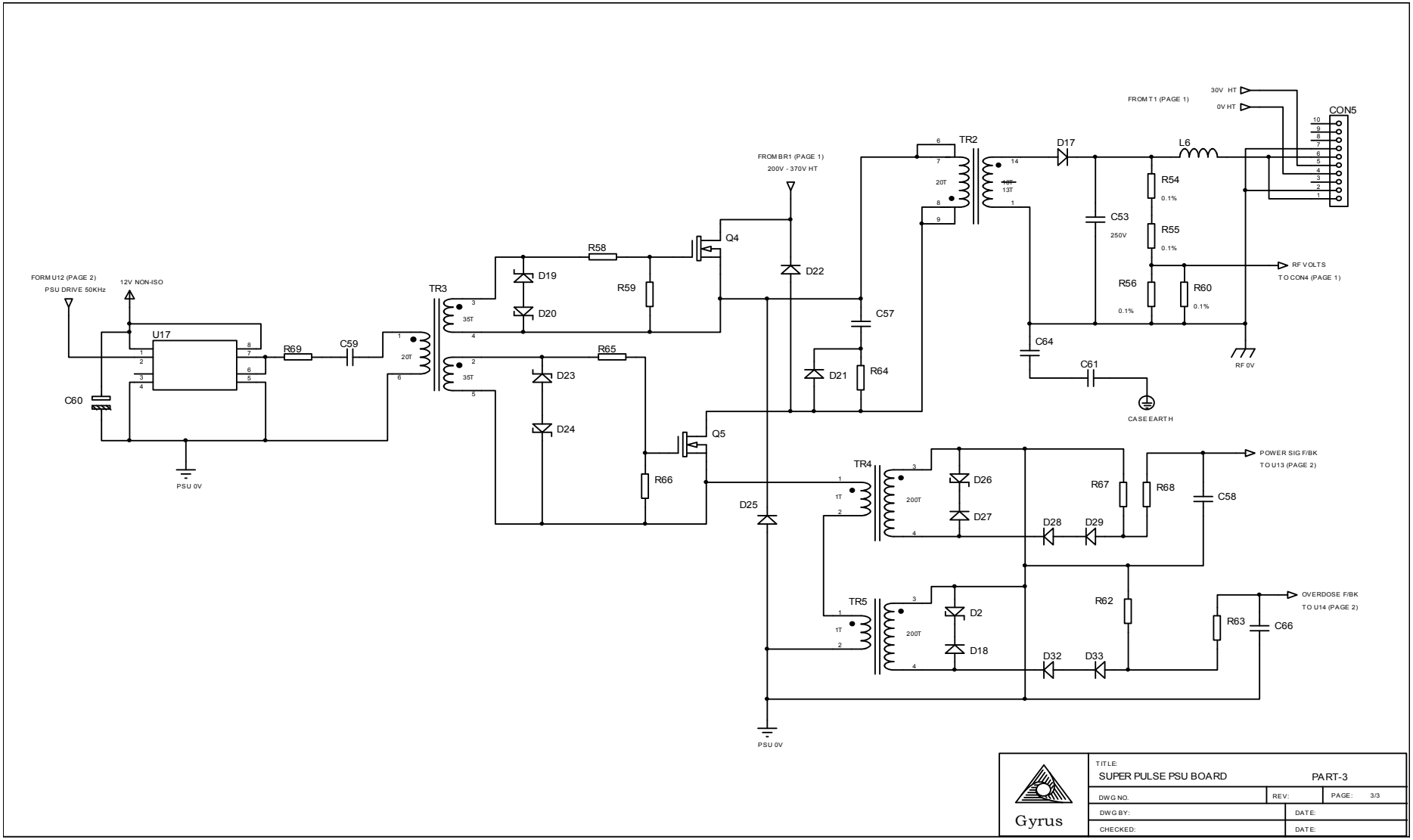
	Link1	Link2	link3	link4
1	N	N	N	N
2	Y	N	N	N
3	N	Y	N	N
4	N	N	Y	N
5	N	N	N	Y
6	Y	N	Y	N
7	N	Y	N	Y
8	Y	N	N	Y
9	N	Y	Y	N
10	*	*	*	*

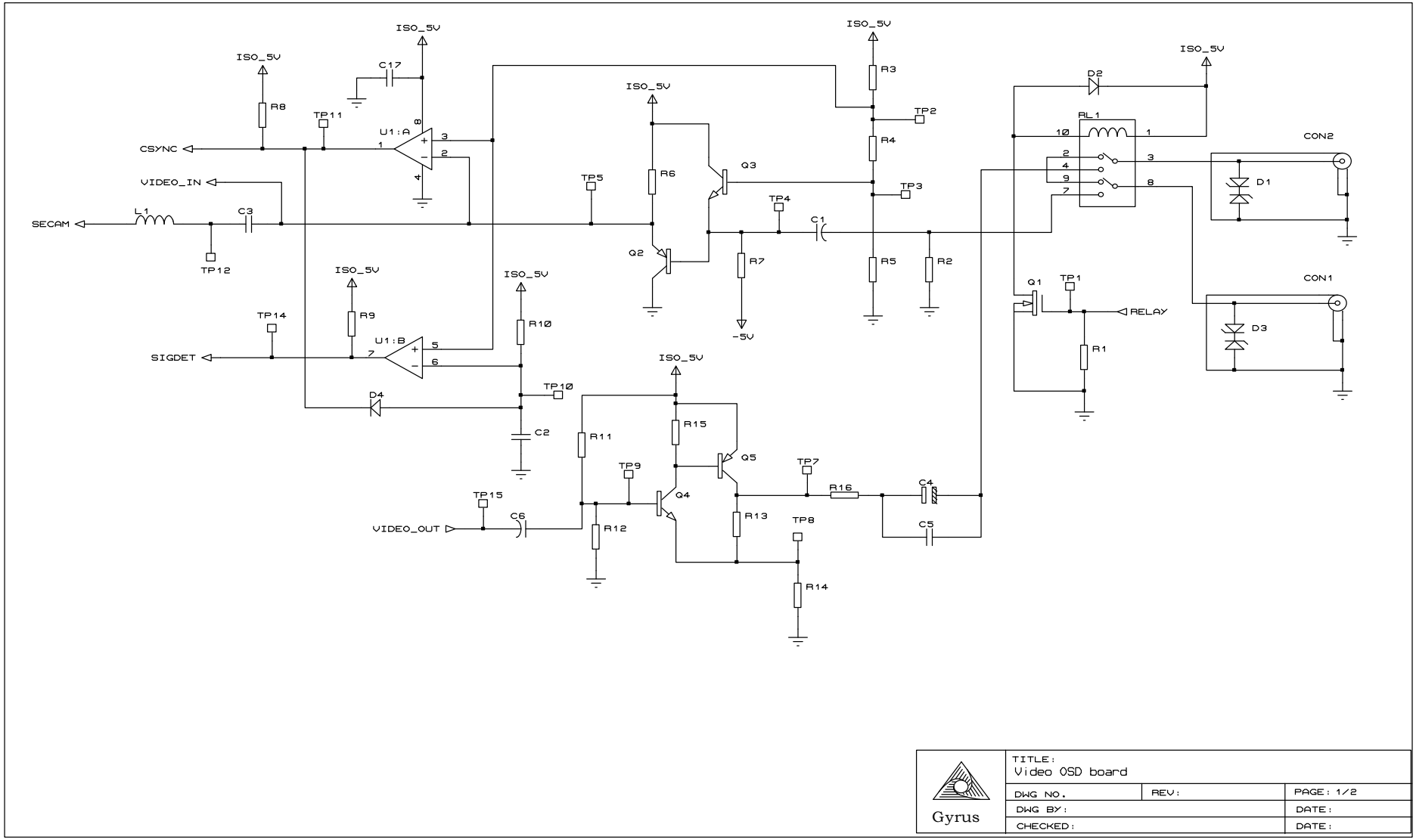
Y = 0R resistor fitted N = 0R resistor not fitted

Gyrus	TITLE: PlasmaBlend SS Board	
	DWG NO.	REV: PAGE: 3/3
	DWG BY:	DATE: 12 Mar 04
	CHECKED: John Hosier	DATE: 30 Mar 04

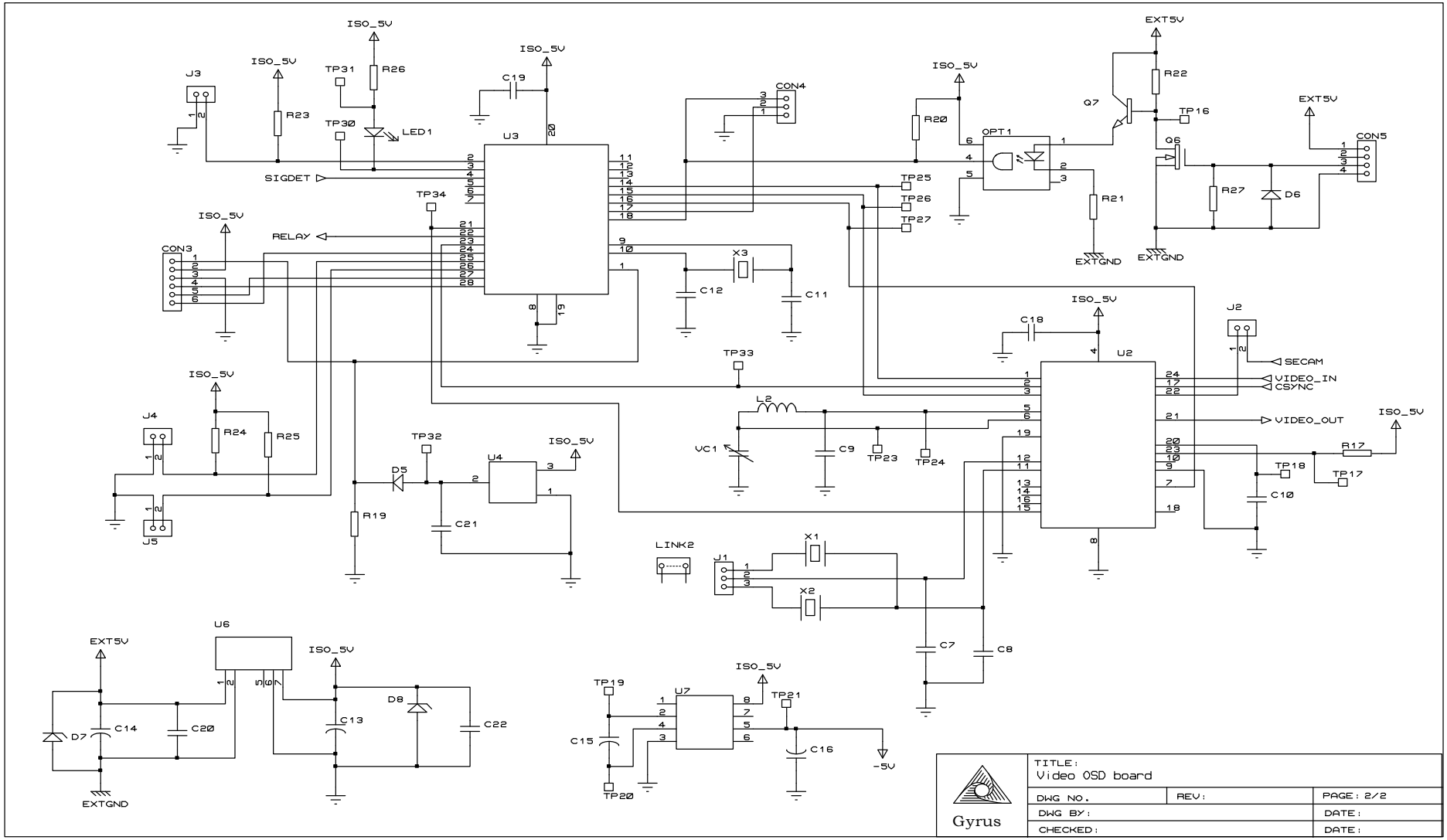

CON1
C1
L1
FK-130G
R1
C36
L2
FK-130G
MOV1
C6
R72
SCR1
R2
SG27
FU1
BR1
8A 800V
C2
GDT1
C3
GDT2
R3
R7
R71
200V - 370V HT
D3
R19
C35
C37
R17
R16
R12
R18
C70
C11
R13
U2:A
U2:B
R11
C12
C15
R15
R14
C10
C13
C14
U18
+5V NON-ISO
OVERVOLTS
TO U15 (PAGE 2)
PSU 0V
CON3
CASE EARTH
D1
R6
U1
R9
SCR2
R20
R74
D4
R10
R4
C71
R8
C4
C38
12V NON-ISO
TP4
L10
in series with D11
& TR1 pin4
D11
30V HT
0V HT
TO CON5 (PAGE 3)
C26
C72
100V
C75
C75 not fitted
TR1
U3
D5
C16
U7
L7:A
12V ISO
C29
C27
L7:B
O/P_0V
D12
L8:A
C62
C39
C28
U8
D13
L8:B
-5V ISO
CON2
TO FAN
+5V NON-ISO
TP2
C19
400V
U4
PSU 0V-TOP
C20
C68
R82
L3
D14
L5
FU2
L9:A N.F.
+5V ISO
C30
R24
C32
C33
D15
R76
L9:B N.F.
O/P_0V
D10
J2
-7V NON-ISO
TP3
D7
C21
C69
R83
C17
C18
D6
U5
D16
C25
OPT1
R27
R25
CON4
12V ISO
-5V ISO
+5V ISO
O/P_0V
RF VOLTS
FROM R60 (PAGE 3)
C34
R75
C31
U9
R26
U6
R21
C22
1000V
D8
D9
R28
R84
C63
TP1
D30
R70
L4
C23
C24
TANT
R23
Q1
R22
R49
0V_SIG
PSU 0V-TOP
NOTES
SYMBOLS:
CASE EARTH
PSU 0V
RF 0V
O/P_0V
0V_SIG
STAR POINTING OF SIGNAL 0V & POWER 0V
ARE INHERENT IN THE PCB LAYOUT & NOT
SHOWN ON CIRCUIT DIAGRAM.
SIMILAR STAR POINTING EXSISTS FOR
SIGNAL RF 0V & POWER RF 0V.
ALL 1/4W RESISTORS UESED 1%
Gyrus
TITLE:
SUPER PULSE PSU BOARD
PART-1
DWG NO.
REV:
PAGE: 1/3
DWG BY:
DATE:
CHECKED:
DATE:

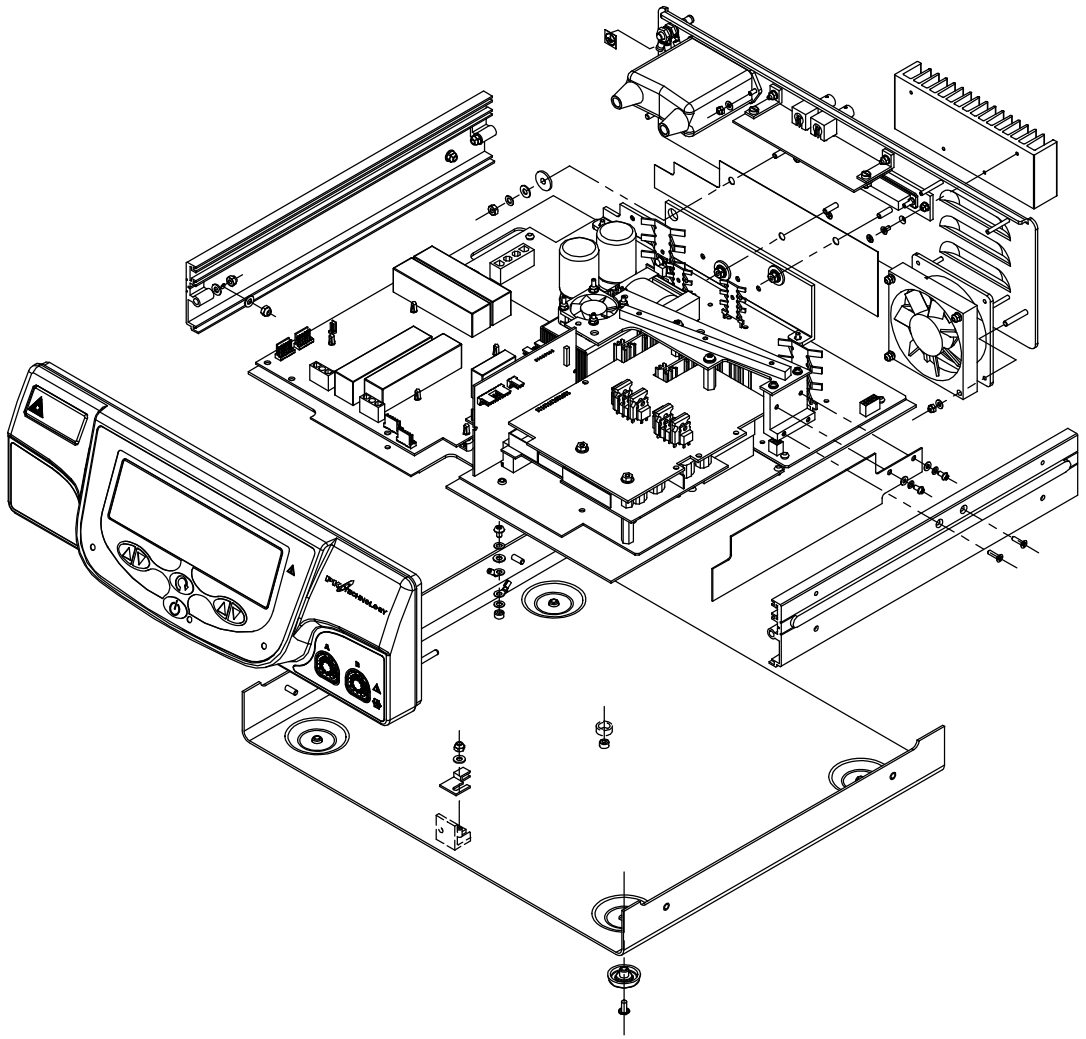

OPT2
C40
R30
PSU 0V
200V - 370V HT
TEST OVERDOSE
J1
+5V NON-ISO
U10:A
R36
RV1
SET POWER
R37
R48
PSU DRIVE 50KHz
TO U17 (PAGE 3)
POWER SIG F/BK
FROM T4 (PAGE 3)
OVERDOSE F/BK
FROM T5 (PAGE3)
R29
0V_ OPTO
-7V NON-ISO
R31
R5
R47
D34
R33
U10:B
C42
C41
63V
R35
R34
C50
C67
C52
Q2
R32
R50
D31
U12:A
U12:B
U11:B
R41
C46
R40
C44
U13
C45
R43
U12:D
U15
R51
CON6
+5V OPTO
R57
U16:B
C74
C55
R78
R61
FROM U2 (PAGE 1)
OVERVOLTS
R42
C47
R44
R46
R45
U19
U14
C48
C54
C49
C65
C51
OPT3
R38
C43
R39
R53
OPT4
R52
R80
RV3
U16:A
R79
SET OVERDOSE
D37
R85
R81
C56
VCC
GND
PIN14(U11&U12)=+5V NON-ISO
PIN7(U11&U12)=PSU 0V
Gyrus
TITLE:
SUPER PULSE PSU BOARD
PART-2
DWG NO.
REV:
PAGE: 2/3
DWG BY:
DATE:
CHECKED:
DATE:

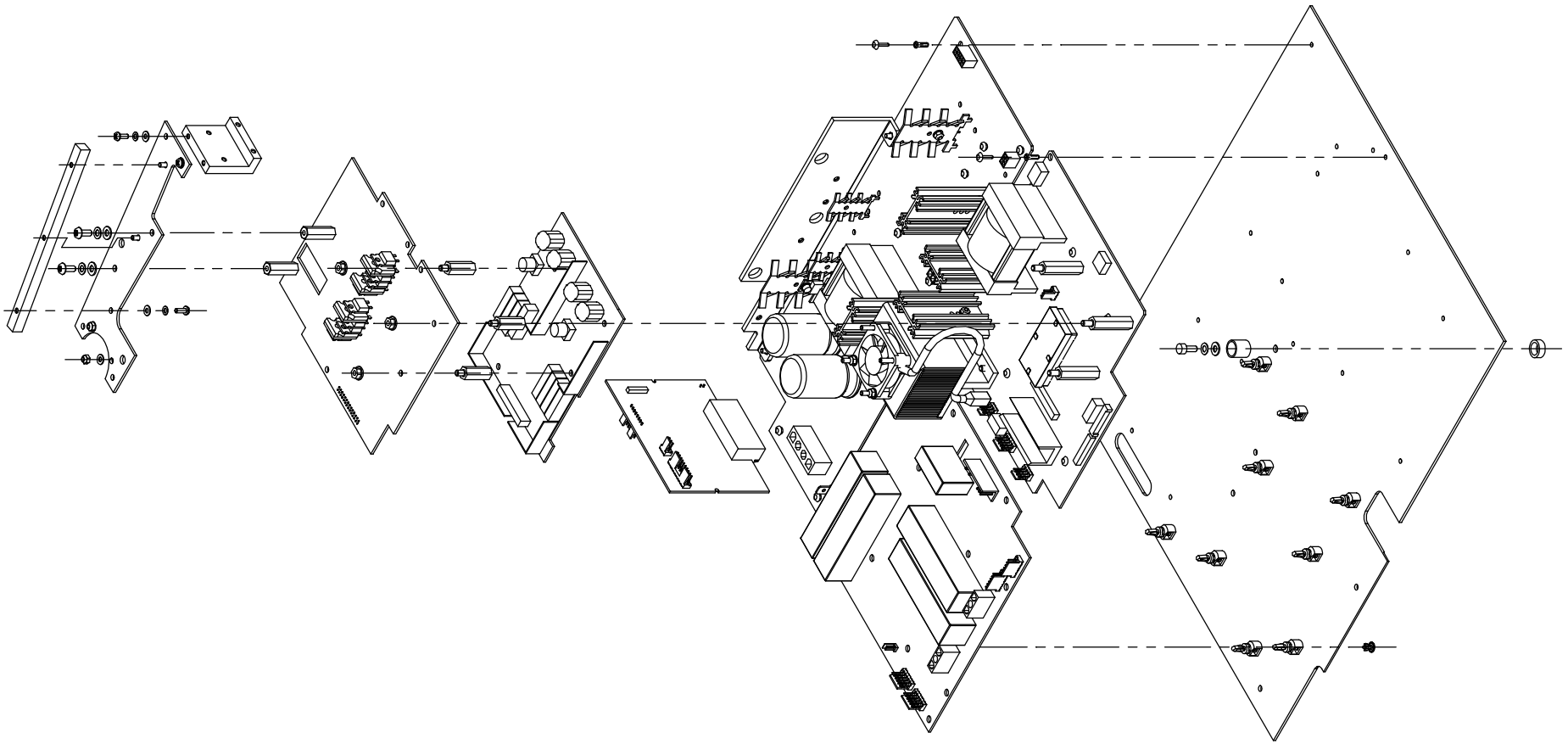

FROM U12 (PAGE 2)
PSU DRIVE 50KHz
12V NON-ISO
U17
C60
PSU 0V
R69
C59
TR3
20T
35T
35T
D19
D20
R58
R59
Q4
FROM BR1 (PAGE 1)
200V - 370V HT
D22
C57
D21
R64
R65
D23
D24
Q5
R66
D25
TR2
20T
16T
13T
D17
L6
C53
250V
R54
0.1%
R55
0.1%
R56
0.1%
R60
0.1%
C64
C61
CASE EARTH
RF 0V
RF VOLTS
TO CON4 (PAGE 1)
FROM T1 (PAGE 1)
30V HT
0V HT
CON5
TR4
200T
1T
D26
D27
D28
D29
R67
R68
C58
POWER SIG F/BK
TO U13 (PAGE 2)
TR5
200T
1T
D2
D18
D32
D33
R62
R63
C66
OVERDOSE F/BK
TO U14 (PAGE 2)
PSU 0V
Gyrus
TITLE:
SUPER PULSE PSU BOARD
PART-3
DWG NO.
REV:
PAGE: 3/3
DWG BY:
DATE:
CHECKED:
DATE:

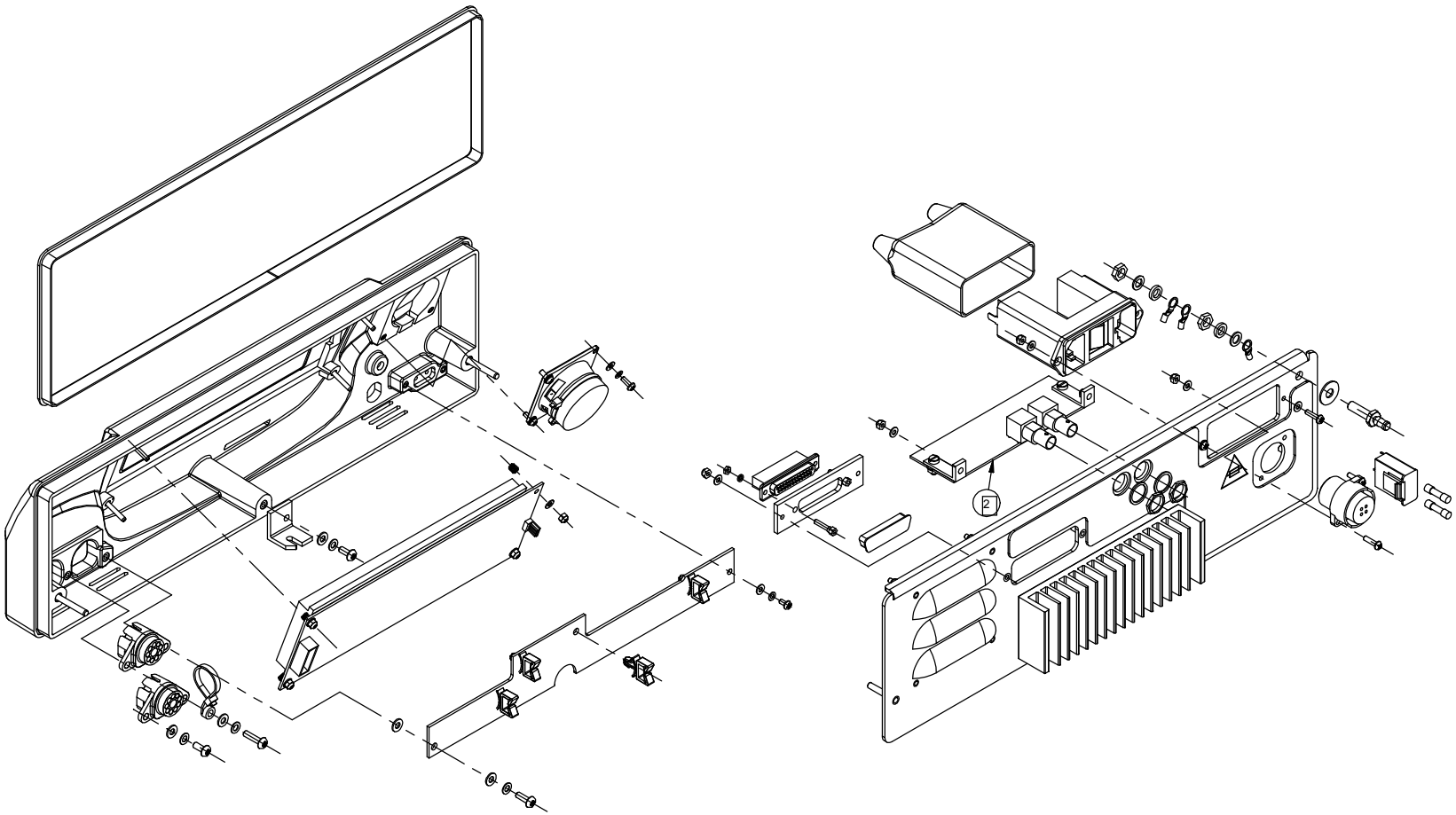


Gyrus	TITLE: Video OSD board		
	DWG NO.	REV:	PAGE: 1/2
	DWG BY:		DATE:
	CHECKED:		DATE:


ISO_5V
EXT5V
J3
J4
J5
J2
U2
U3
U4
U6
U7
CON3
CON4
CON5
OPT1
Q6
Q7
LED1
SIGDET
RELAY
SECAM
VIDEO_IN
CSYNC
VIDEO_OUT
LINK2
EXTGND
-5V
TP16
TP17
TP18
TP19
TP20
TP21
TP23
TP24
TP25
TP26
TP27
TP30
TP31
TP32
TP33
TP34
R17
R19
R20
R21
R22
R23
R24
R25
R26
R27
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C18
C19
C20
C21
C22
D5
D6
D7
D8
L2
VC1
X1
X2
X3
TITLE:
Video OSD board
DWG NO.
REV:
PAGE: 2/2
DWG BY:
DATE:
CHECKED:
DATE:
Gyrus






2